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NOV. 24, 1952

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NEWS DIGEST

Domestic

Charles H. Bobb, Los Angeles aviation pioneer, who was president and chairman of the board of the Bobb Co., Inc., aircraft and aerospace designer, died Nov. 15 at a coronary ailment.

The Turbo-Compound Super Constellation is now undergoing an extensive testing program, following its maiden flight having just over two hours. The test pilot, a Navy test pilot, ILR-3, showed greatly improved acceleration and climb over earlier models.

Brig. Gen. Henry Stark Clegg, a product of the early days of military aviation, died Nov. 14 in Walter Reed Hospital, Washington, D. C.

The Cleveland National Air Races Corp. has announced that the 1953 classic will be held at Vandalia Municipal Airport, Dayton, and that its new title will be "The National Aircraft Race and 50th Anniversary of Powered Flight Meeting" at the Wright Brothers

Edward A. Schatz, who was chief manager for the Army Service Corp., and a pioneer in the art of aerial mapping, died recently at his home near Miami, Florida.

"Wen" Heil, who was a chief engineer for All American, Circleville, Calif., was killed recently when the engine of his plane failed after takeoff from Lodi Airport Field, San Diego.

The Tennessee Valley Authority has purchased three helicopters, two of which already have been delivered, Ed losing successful use of a leased helicopter in controlling transmission lines.

Donald E. Mattox, Detroit executive, has been notified that his speed records flying a 145-hp Curtiss-powered Cessna 170 equipped with His Fast have been accepted by Federation Aeronautique Internationale as world records. Class C-7B requires over a 50-kilometer closed circuit. Mattox's land speed, checked on Oct. 25, were 109.85 mph for 100 km and 187.27 mph for 500 km. Previously he was credited by FAI with an airspeed distance record of 96.45 mph for a Bessonneau Tri-to-Rudder, II, flight, June 12.

Civil Aeronautics Administration has acquired a 10-ton fleet to evaluate heliports and harborage transports with a view toward developing safety and certification standards for these types.

Air Force reports an increase of 26% in profits for the first eight months of this year compared to the same period last year.

Bethleem Aerospace Corp. reports that although its income profit increased to \$755,000 in related revenue in the winter months it failed to meet a target of about \$4,700,000 for its fiscal year.

Fairchild Engine and Airplane Corp. reports a net of \$1,837,000 for the same period ending Sept. 30. A 25-cent dividend was declared payable Dec. 22 to stockholders of record on Dec. 3.

Grumman Aircraft Co. has declared a dividend of 50 cents a share payable Dec. 22 to stockholders of record Dec. 9. Grumman announced adoption of policy of paying a regular semiannual dividend of 25 cents per share, to begin in 1953.

Saudiaf & Western Airlines, Inc., reports net earnings of \$801,333 for the nine-month period ending Sept. 30. Gross operating revenues of \$8,840,559.

Southern Airways Co. reports net income of \$51,600 for nine months ending Sept. 30.

Kane-Frost Corp. and subsubsidiary report net income of \$344,064 out of total sales of \$57,265,157 for the three months ending Sept. 30.

Manasco Manufacturing Co. had a net profit of \$53,629 for fiscal 1952. An additional 10-cent dividend per share of stock will be paid Dec. 12 to shareholders of record Dec. 1. Dividends was reported an excess of \$57 million.

Tenneco Aircraft Corp. reports net earnings of \$15,000,000 for the nine months ending Sept. 30, a 31% increase over corresponding period in 1951. Unified orders amounted to \$125,000,000.

Northwest Airlines has paid an dividend of \$15,000 on its book loans, reducing the loan to \$7,500,000.

International

Quonset Empire Airways now is operating the longest commercial overseas hop in the world on its new route from Sydney to Johannesburg, a 2,677 mi leg between Minas Gerais and the Coco Islands, using Lockheed Constellations.



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INDUSTRY OBSERVER

► Present MDAF commitments include delivery of a dozen Skystar 555 se passenger helicopters to the ground forces of NATG. Skystar has shipped over 500 to the French SNCASE firm.

► The new aircraft planned to be built for Navy by Glenn L. Martin Co. probably will carry the designation XP-64.

► Republic Aviation Inc. is developing a new supersonic fighter designated the XP-101. The XP-101 is also a Republic fighter aimed at eventual replacement of the Convair F-102 as the standard USAF supersonic interceptor.

► Initial order for the Boeing B-52 will be for RB-52A photo-reconnaissance version. No bomber versions of the B-52 have been scheduled for production before the end of 1955. Both the XB-52 and the YB-52 experimental prototypes are continuing their flight test programs at a good pace with all flights made last week. The YB-52 is now being instrumented for advanced flight test work while the XB-52 is scheduled to do high gross tests at Muroc Lake with an Air Research and Development Command team.

► Air Force does not expect to get fighter jet prototypes of the Wright J67 supersonic fighter before the end of 1955. The J67 has been considered as potential for stratospheric fighter type scheduled for operational production by the end of 1955.

► Chase Aircraft will start the first production version of the C-123 assault transport at its Teterboro, N. J., factory in a few weeks. Main changes in the production model include a squared-off tail fin, larger paratrooper jumping doors, and more powerful versions of the Pratt & Whitney R-2850 engine developing 2,500 hp. per taking.

► Convair 150, which is scheduled to replace the radial-engine 100/115 series, is due to be announced during the company's annual sales meet from January 18-20 at Wichita, Kan., in January. The new 150 powered with its turboprop engine, resembles the famous 100 models but has a squared-off service tail fin. Also, the longitudinal tail is adjustable about three inches of trussing.

► American safety experts question a recent British medical report that more than half the passengers in a Viking transport crash were injured as a result of "losses of the bone in the sun belt." Cornell University Crash Injury Research survey of 500 victims in plane crashes showed that only 12 had bone injuries (usually broken) in the vicinity of joint seats. Convair analysis of the British accident data indicated that the fewer injuries occurred in the seat belt area and did not produce positive proof that any injuries were due to the belts. Stronger seat belts and shoulder harnesses have been developed and adopted in this country as a result of the Convair research.

► De Havilland is planning a third Comet production line at its Gloucester plant if additional orders accumulate at a sufficiently rapid pace. Some Comet parts already are being made at Chester. De Havilland is extremely sensitive to continued British and foreign criticism that its slow production rate is discouraging many new orders for the jet transport. De Havilland says its current Comet production pace is adequate to handle the volume of orders received to date.

► Douglas C-124s in service with MATS recently flew for 11 hr. and 38 min. while making a nonstop flight of 3,265 nautical miles from Ramay AFB, Fairbanks, Alaska, to McClellan AFB in Washington.

► British Overseas Airways Corp. is thinking of using unsinkable air raid aircraft on its Comet jet transports. The aircraft would prevent the jet engines from crashing in pools, overhead signs and other obstructions material during ground runup and taxi maneuver.

WHO'S WHERE

In the Front Office

Stephen F. Kestigian, former director of military contracts for Republic Aircraft Corp., has been named executive to the vice president in charge of the Aero medical division. Kestigian has handled military contracts since he joined MHI in 1948. L. J. (Larry) Hansen has been designated vice president of the divisional division of Republic in Cleveland, Ohio, under chairman of operations. Hansen was president of Republic's propeller plant 1945-1950. His former post as another general manager has been filled by Bert W. Steiner, also ex-RAF pilot.

Fredrik B. Gross, general manager of General & Electric's New York management of the later elected chairman of the board of U.S. Airlines, certified freight carrier. Other new directors include Fred A. Miller, U.S. Airlines' new president, Col. Paul D. Strohmeier, Col. G. Charles Moore, Jay W. Knoblauch and Enoch R. Phillips.

Changes

H. Allen has been designated chief engineer of the USAF heavy prop planes for Lockheed Constellation Co., Inc., N. Y.

J. Howard Batchelder has been named general manager of Lubbock Mil. Co., Lubbock, Texas, and has been appointed chairman of the Lubbock A. Kraft Jr., has been appointed sales manager.

West Alton C. E. Todd, USAF (Res.), has been named manager of Continental Can Co.'s Cincinnati, Ohio, plant, replacing Robert D. Tamm, who has retired after 27 years.

Bernie H. Fuchs has been appointed an craft sales manager of Penn Products Division of Penn-Worrell Corp., Cleveland.

De George General, former principal mismatch negotiator for Republic Aviation Corp., has joined Eastern Industries Corp., N. Y.; it is engaged in aircraft and space projects. The firm handles jetliner marketing and advertising.

R. B. Smith and Russell Stromgren have been appointed Middle West and Eastern regional managers of the management for Glenn L. Martin Co., Los Angeles.

E. W. Hartman has been designated manager of Wright Aerocraft division's space parts division, Wood Ridge, N. J. R. E. Baase has been named assistant area manager of the firm.

Honors and Elections

Sir Godfrey de Blaafeld, founder and director of the de Havilland Aircraft Co., Ltd., has been chosen recipient of the Guggenheim Medal for 1953 in recognition of his forty years of pioneering in military and commercial aircraft design and development of long-range aircraft. Phil G. C. Morris, managing director of DHC Canada, has been awarded the McKee Trophy, given annually to the person who has done most toward furthering Canadian aviation during the past year. Morris received the trophy for his development of the DH Beaver and Otter.



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See Page 8 for details • Part Work • Engineering News
An integrated service for the U.S. Air Force, DIA, Defense, and industry and professionals • Aviation Week & Space Technology

Washington Roundup

Defense Program: Overhaul

Fist action of incoming President Dwight Eisenhower on defense, it is expected, will be to appoint a commission of civilians to scrutinize all aspects of the military program and come forth with recommendations aimed at getting "sophisticate" scrutiny for reorganization cost.

It is likely to touch off the bitterest inter-service review conference. It also means that the services face an uphill struggle next year against losing authority to the Secretary of Defense.

The defense committee was first formally proposed by Sen. Robert Taft in his campaign for the nomination.

The proposal was included in the Republican Party platform: "We shall review our entire preparedness program and we shall stop a place a place, lack of coordination, inertia, and conflict between the services."

The probable effect of establishment of the review commission: Any major change in the defense program by the new administration will not be reflected until the 1955 fiscal year budget. This will result Congress in June 1954, and will be for the year starting July 1954.

Sen. Styles Bridges, key Republican in Congress who can have his choice of the Senate leadership post, chairman of the Armed Services Committee, or chairman of the Appropriations Committee, estimates it will take the committee about six months to complete its work.

Congress: Little Change?

Electoral changes in the membership of the House and Senate won't likely to affect the final outcome on tax aviation issues.

There will be 20 more Republicans and 20 fewer Democrats in the House and one more Republican and one less Democrat in the Senate next year. There also will be more replacements not reflected in the party totals, such as replacement of Rep. Bradley Bedford, who headed House Interstate and Foreign Commerce Committee's Aviation Subcommittee this year, by Rep. Eddie Boyle.

But what this year on vital aviation issues weren't so clear, the outcome would be affected by these electoral changes. For example:

- The House vote in favor of dropping a ceiling on defense spending—which would mean a slowdown in plane deliveries—is 229 to 130.
- The Senate vote for freight and mail pay demands for international carriers is 53 to 28.
- The Senate vote against making certificates fungible carries eligible for subsidies is 53 to 28.
- The Senate vote spent nothing back on Post research and development money was 47 to 30, and, against striking USAF operational funds, 49 to 25.

Subsidy Legislation

Changes in the makeup of House and Senate Interstate and Foreign Commerce Committees seem to favor the no-subsidy side in their fight against federal aircraft subsidy legislation for the scheduled industry.

In the House Committee:

- Four of the 15 members who went along with the legislation favored by the scheduled industry won't be back next year: Rep. Bradley Bedford, Rep. John McClellan, Rep. Leonard Hall, Rep. Sherman Dennis.

• All eight of the committee members who backed the subsidy and supported legislation establishing a rapid mail farm system and opening the robbery field in the consolidated airports will be back—Rep. Charles Wolverton, no chairman, Rep. Arthur Kline, Rep. Wilson Goode, Rep. Louis Heller, Rep. Nease Masland, Rep. John H. Hodson, Rep. John Williams, Rep. Homer Thornberry.

• Among the selected congressional Rep. Peter March, who has been a lightning rod around the world a year ago.

In the Senate Committee:

- The ranking next year will be greatly changed. There are two Democratic vacancies and three Republican vacancies to be filled by new senators.
- All five of those seats had been filled by members who supported the scheduled airline position on aircraft subsidy legislation. Sen. Ernest McFarland, Sen. Herbert O'Connor, Sen. Quayle Brewster, Sen. James Kraft, and the late Sen. Ross McMath.

Airline Attorneys

Scheduled airlines and associations are financing some legal maneuvering with political and taxes with CAB free in the Board's investigations to determine the nature of competition in the industry.

Representing the airlines will be:

Hardy Marion, former CAB counsel, representing North American Airlines.

Morris Rosenthal and Bain, representing American Air Transport Inc., and Air Coach Transport Corp. Senator George Meany formerly was president of the American Air Arms and power member Albert Belard, a former CAB counselor.

Whitlock and Whetstone, representing Central Cargo, Inc., in the five of Jerome San, Marion Wheeler, former chairman of Senate Interstate Commerce Committee.

Dennis Radovich, Tydium, Beebe and Woods, representing Freight Air Inc., and Woods, representing the Russell Corporation, formerly of Russel, Joseph Dorn, Donald Radovich, former head of the National Recovery Administration and assistant to former America General Insurance Company, Arthur D. Condon, former attorney for the Bureau of Internal Revenue and Maritime Commission, former Sen. Milledge Tydings.

James Berg, Fox, and Avant, representing World Airways, includes Wendell Berg, former Assistant Attorney General, and Albert Avant, former assistant to Attorney General Francis Bell.

Pagan and Neil, representing Western Airlines and Alaska Airlines, includes L. W. Pagan, former CAB chairman and George W. Neil, former CAB counsel.

Gladden, Parker, Wetherby, and Beale, representing Trans World Airlines, includes Gerald Hoyle, president Democrat appointed to represent the company as a director of General Aviation and Film Corp. which houses TWA President Jack Foy heads.

Costigan and Bardin, representing American Airlines and Pan Am, in the last five years of State Dean Arbenz was formerly connected with and is expected to resign. His son, David, is a junior partner.

Edward Loebman, representing Continental Airlines and Northwest Airlines, former CAB chief examiner.

—Katherine Johnson

New Cutbacks Hit Aircraft Programs

- **Slashes follow line set by Campbell Report.**
- **Funds to go to newer plane, engine types.**

By Robert Hite

Budget cuts in production of obsolescent military aircraft types were made last week by the Air Force and Navy as a result of probing by Defense Secretary Robert Lovett. Procurement funds received from the cuts will be used to improve production of new types.

► **Airplanes-USAF** cut the following programs:

• **Northrop Scorpion** (F-89) two jet night fighter. All current orders of the B and C models have been canceled. The F model is still in a research and studies funding situation. Funds will be released as soon as possible.

• **Northrop Super Sabre** (F-98) two jet night fighter. All current orders of the B and C models have been canceled. The F model is still in a research and studies funding situation. Funds will be released as soon as possible.

• **Lockheed Starfire** (F-104) all nuclear interceptors. This model equipped, rocket firing lights are already in production. Some of the production program goes on, but funds released by USAF now can be used for other aircraft.

For the Navy the Bureau of Aeronautics made the following cuts:

• **Graham Cougar** (FVE-6 and -7) competing interceptor jet fighter. Navy had originally planned a heavy production program for this fighter in 1953; then 1959 planes during the next two years. Such a plan was heavy.

• **Douglas Skyraider** (A1D) post-atomic attack plane. The Skyraider has been the Navy's standard postwar carrier based attack plane and gained an excellent reputation in Korean combat. It is scheduled to be replaced by the proposed AID.

• **North American Sabre** (FJ-1) carrier based jet plane planned by the Navy as a successor to the FJ-1. The Sabre is the largest U.S. carrier-based bomber and Navy's first plane equipped to carry atomic bombs. Navy recently announced that it planned to convert

Air Force Production Figures

In a detailed report covering all phases of the USAF procurement program, Secretary Thomas Fahey wrote:

"Accordance accepted by the Air Force in August totaled \$1 million. Its aircraft weight compared to only 14 million defense. The accepted during August, 1950. Specifically, total fighter production in July 1952 was about five times the amount of two years ago, weight of fighter production was up more than 1952 than in 1950. Bomber production in July 1952 was five times higher than in July 1950 and in terms of weight even more. Higher than 1950 was 1952."

"In the case of engines, Allison and General Electric are currently having an average of 2400 a day compared to approximately 600 a day one year ago for same aircraft. During the first six months of 1952, 3650

of the applicable production which was met."

"At present, avg production of the B-47 is 1000 planes per month and hardly started. Today at Boeing Wichita, one of the three plants dedicated to the program, B-47s are being built out at rate of better than one per working day. In the fighter category, two years ago the entire monthly output of F-86s and F-100s was 15, or less than one a day. The combined output is now running around 2400 a month, or better than 15 per day."

"In the case of wings, Allis and General Electric are currently having an average of 600 a day compared to a total of 17 per day two years ago."

The Strategic Department is extremely anxious to procure a well-coordinated mix of its planned tanks and aircraft procurement policies and programs to the Air Force Congress. Even without the impetus of concern mentioned, Bapchukin stated, there was a growing congressional dissatisfaction with the military procurement picture as it developed after the Sabre air raid.

► **Pilotless aerial vehicles**. At the same time the Defense Department was quietly making arrangements for the principal recommendations of the Campbell Report. Secretary Lovett was strongly defending defense procurement policies against the sharp criticism of the Senate Armed Forces Subcommittee on Personnel headed by Sen. Lyndon Johnson. Marshall statements from the Joint Chiefs of Staff, Marshall Board and the Secretaries of the Army, Navy and Air Force, Lovett made the following points as relevant to the most recent report of the Senate Subcomm. Senate Aviation Week Sept. 3, p. 16.

• The emphasis in military aircraft production has not made entirely for fixed wing aircraft, but also in the conversion aircraft which may have followed from a sharp buildup to a peak followed by a sharp decline.

• In moving production schedules and stretching them out over a longer period of time, immediate requirements for

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LOCKHEED F-94 STARFIRE, including adapter units auxiliary missile pods (fuselage nose wings) in use of planes being cut back under new USAF plan

critically short production equipment, materials, and manpower were released," the Monson Board stated. "And that critical shortage demands more for the U.S. military forces."

• The John Clegg of Staff have never stated that the years 1953 and 1954 will constitute the period of our greatest peril, as quoted in the Senate report. Lovett and the JCS mentioned the general period of 1954 as the date by which Britain's capabilities will become "very dangerous." They do not estimate that Britain intention to make war in 1954 as much as they do in 1953.

• The greater safety standard could be made that to force aircraft design at this time.

• Apparatus of a defense production war is neither necessary nor desirable. Lovett noted that he had suggested High Dress, a vice president of General Motors Corp., in charge of nuclear war as a full-time production expert.

• The shutdown of aircraft production

would often under the MDMR program because the original production schedule for the program was revised. The contractor applied only to production for the U.S. military forces.

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Odlum Suggests B-60 Jet Airliner

Consolidated Vultee's B-60, single seat jet powered aircraft, is the B-52 model available as a commercial jet transport in 1955, and it could carry 180 passengers coast-to-coast in 600 hours, according to C. G. Odlum, chairman of the board, Floyd B. Odlum.

Odlum said that the military version manufacturing space and personnel to allow Convair enough "leisure room" to undertake the task with sufficient facilities and manpower.

Other items of interest cited by the Wings Club this month:

• Planes capable of speeds up to Mach 2 are already under construction.

• No aircraft designer should be compelled to develop a commercial transportation to build it alone.

• The 2½ days now required by defense manufacturers does not allow enough "fat" in the design to make it competitive to large bombers.

• Cost and production rates of planes can be reduced. They are too complicated, require too many and too high precision parts. We need new techniques to simplify plane construction, especially military aircraft, where life expectancy is low. Possible greater use of plastics might be the answer, Odlum suggested.

Quick Trans-Arctic Route Hearing Urged

State Department is urging Civil Aviation Administration to expedite opening of the Europe-West Coast trans-Arctic route application of South African Airlines System. State and CAB consideration by Dec. 31.

U.S. citizens feel CAB that if SAS that the route they want to do the same. Thus, if the Board is not ready for U.S. application, it should be open to SAS to file application to open the route. Pan American, TWA, Western and other airlines presented their views to CAB at an informal conference. The Board has not discussed the matter with any SAS spokesman, but may by Dec. 31, or early next year.

The CAB members have not yet studied the plan with care. Kit justified is that if the Board allows SAS to start scheduled West Coast-Europe service about as SAS does, then U.S. prestige considerations may dictate that a U.S. line operate the route, too, and the subsidy and rate that would be high. Present traffic demand for such service is considered low (Aviation Week Oct. 6, p. 14).

The director of State Department's Transport and Communications Office,

British Also Order Cutbacks

Britain's current economic crisis in the defense budget already has forced a cutback in the production of obsolescent aircraft types, similar to the recent action by USAF and Navy.

Hudson felt the budget can hardly double again. Originally the program was held for production to be off-set from 1955 to 1960, the decision, Hudson said, that makes orders into the quantity production will be authorized for the Vickers Valiant, Avro Vulcan and the Hawker Pave HP 60, compact-winged bomber just now by four Spitfire jets.

The Gloster Javelin will take over, current order for the de Havilland Venom and the Armstrong Whitworth NF-11 have been cut back.

Most critical effect of the economy budget may be the new generation of high-speed bombers in which the Royal Air Force is competing for maximum power between three rival firms. Hudson said that the order action into the quantity production will be authorized for the Vickers Valiant, Avro Vulcan and the Hawker Pave HP 60, compact-winged bomber just now by four Spitfire jets.

J. Paul Bassinger, up until now in charge of this major airline's valuable business of the short-haul charter and time. The main question is when.

If CAB considers the SAS application by Dec. 31, as Bassinger hopes, the Board may have an opinion before spring when SAS hopes to start the scheduled service.

Trans-Canada Buys Turboprop Viscounts

Trans-Canada Air Lines has placed an \$11-million order for 15 Vickers Viscount turboprop transports. This is the first airline order for turboprop transports on that scale of the Atlantic.

TCA President Gaudie McGregor and the Vincents would be well served to understand TCA's current fleet of DC-3s and North Stars in its domestic routes. This means U.S. passengers will get their first introduction to the relatively quiet and comfortable turboprop transports when TCA introduces the Viscounts on its New York-Montréal run sometime during 1967.

► **Dilemmas**—Vinson has presented TCA full details of its first Viscount in the fall of 1959 with the return order scheduled for delivery by the end of 1965. Years earlier, the British Board of Trade reported that the TCA Viscount order was the largest single dollar order received at Britain since the end of World War II.

Vinson recently announced Vincents' acquisition of British Airways' Wedgwood Fleet and added an extensive component plan manufacturing operation at Hem to allow Vincents' entry to be accommodated in 1969. The production switch of the Vincents' aircraft to the Wedgwood line that sounds like division to British European Airways.

► **Win Over SAS**—The TCA order was placed after an 18-month evaluation of the Viscount and the Convair 340 to meet TCA's future medium range domestic transport requirements. TCA recently ordered eight Super Constellations fit its various routes.

TCA currently operates over 16,000 route miles and has reported a steadily increasing passenger business during the past 18 months.

Vinson also has about 50 Viscounts on order with another 10 still under negotiation.

New Terminal

(Courtesy of *Aerospace World News*)

Begins—Construction of a new international airport for Cuba is scheduled to begin soon. The field, planned as one of the best terminals in Latin America, is expected to cost \$12 mil-



LEE

ADAMS

RYAN

GURNEY

CAB Shuffles Chairman's Duties

Board assumes power to hire and fire, now controls staff matters of policy and major projects.

Civil Aeronautics Board has ended the powers of its chairmanhip, as predicted by *Aerospace Week* (Oct. 27, p. 51). The four present members, including new Chairman Oswald Ryan, now掌管 the Board's power to control of the 585-man staff back in the hands of the whole Board.

Former Chairman Donald Nepp has managed staff affairs himself until resigning Nov. 1. Remaining four members are: Ryan, new Chairman and long-time vice chairman; Robert L. Gurney, who recently was chairman of the Senate Armed Services Committee; and now is considered leading prospect for CAB chairman next year; and Democrats Jack Lee and Joseph Adams. The fifth member probably will be filled by Housewoman appointment shortly after Mar. 3.

The procedural changes are exactly those predicted in *Aerospace Week*. And they are in full effect with a special revision of the President's CAB Reorganization Order of 1959—an amendment to that article, and related to the Board's personnel committee, was made in January.

► **Change**—Here is why we believe:

► Executive Manager and Flying, down to the division chief level is "subject to the approval of the Board." The CAB press release interpreting this language as authority under the President's old reorganization order, states: "Previously, the Board had defined the term 'heads of major administrative units' as including only the executive director and the heads of offices and bureaus. With recent action, the Board has modified the terms so as to include . . . the executive head of each office and bureau, and heads of divisions in each office and bureau."

► Board controls staff others than policy and major projects. The executive director of the staff, James Verner, remains on the full Board. The CAB members apparently believe that the increased efficiency of the specialized "business committee" system outweighs

"the potential advantages of a more theoretically independent "public board."

This also is borne out in a further acknowledgement by the Board of its progress which has been made in obtaining more efficient operational results under the Nepp administration. Nepp credits the way in which the Board has been able to make greater use of its authority, especially after the series of orders last winter.

He also yielded great credit to his Board members for their play to "conserve the progress" made in efficiency improvement as concerned.

► Director reports to the Board once weekly "to receive instructions and to report concerning overall progress as well as on the most important actions taken to date." Previous, Verner not only reported mainly to the Chairman but was obliged by the Chairman to serve as the latter's executive assistant. Now it is the staff director who is constantly tied down to the Chairman's office, and the other Board members feel he had little say in planning the staff work which is considered so vital to the Board's function. This is a marked contrast to the chairmanship of the past.

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► **Nose-High Takeoff Cited in Comet Crash**

An unusually nose-high takeoff attempt is believed to have been responsible for the accident involving a BOAC Comet at Campine Airport at Rome, according to some available reports.

Few contact with the ground apparently was made by the tailhook which dragged down the nosecar for some distance.

The accident occurred shortly after dark.

Major damage to the aircraft occurred when it came in contact with asphalt-bound ground at a speed of approximately 200 mph. The aircraft then collapsed. The Comet's rear visibility was impaired when the aircraft settled to the ground. All emergency equipment functioned. All fire extinguishers operated. Fuel cutoff switches shut down the four engines all of which were up to maximum setting at full thrust. Electrical systems were certified and standard color lights were automatically energized.

► **No-Believe**—The aircraft came to rest, one of the canards had ripped off, the other had broken, and the port outer fairing, containing a 2,110-gallon drum of kerosene fuel. The right fairing followed the aircraft in a nose-over-tail attitude controls E and I applied at the last minute, but there was no fire. Nine of the other tanks was punctured or was there no sign of a leak from any of them.

None of the 47 people aboard was injured.

BOAC informed in the official statement issued by the British Ministry of Civil Aviation that neither the aircraft nor its engine had suffered damage.

No official report has been issued on the cause of the crash.

Safety Built In

- That is feature claimed for all-metal Heliophane.
- First of military version to Army next month.

First delivery of a military version of the radically designed low-flying four-glass Heliophane is due in December. Civil versions will be forthcoming early next year.

He also yielded great credit to his Board members for their play to "conserve the progress" made in efficiency improvement as concerned.

However, the present four Board members say they play to "conserve the progress" made in efficiency improvement as concerned.

For an unusual construction, the conventional Heliophane canopy will be similar to most in the form of the four-pane panels of Concorde which made its debut at the August 1969 Detroit National Aero Show and which has been demonstrated to the company's satisfaction.

Safety Protection—Designers safety features play a dominant role in the aircraft. The four-glass canopy was produced. The safety glass canopy was produced. Steel side structure surrounds the cabin. Seats are designed to take 11G loads fore and aft. Shoulders harness is provided. Landing gear is set well down to prevent nosing over. If the pilot wants the slow speed in emergency it is hard to conceive of an accident from which the plane's occupants can't walk away, the designers say.

The airplane was engineered by Prof. Kappes, associate professor at Massachusetts Institute of Technology, in Cambridge, Massachusetts, and was manufactured by the company of the flying public. The money was collected by Fred Lewis Ballouge of Harvard University School of Business Administration.

Designed to take advantage of safety lightness designs in order to fly slowly, the Heliophane can maintain level flight at 30 mph and operate with full load from a 100-ft strip, its designers have demonstrated. It is designed to cruise at 150 mph.

► **Landing Engine-Heliophane**—It is a 250-hp Lycoming GO-365 engine having a Herkules propeller with reduction gear.

Wing is fitted with very large flap, plus leading edge slat, retractable gear, and is designed to be operated by Prof. Kappes' former World War II

had designed the spacious General Aircraft Scholar two-place cockpit, with two-control option. The low price tag is the second Heliophane. The design principles were right tested previously in a series of Can-Can two place prototypes in 1969.

Heli Aircraft Co. has been struggling to get into production on the military and commercial versions for either a year, and at last has had a test aircraft schedule with DPA for 17 planes a month. Current plans are to build the commercial planes on order, with down payments in advance.

AF Officer Sees Need for Complexity

"Get as simplicity and don't worry about complexity," said Col. J. J. Smith, USAF, in the recent *Mechanical Systems meeting* of the Society of Automotive Engineers.

Smith, who spoke as spokesman to present day aircraft, is special assistant to the Deputy for Development, Air Research and Development Command. He had been a member of a group recently convened from a study of the conditions in Korea and drew on that experience for his talk.

Smith's general thesis was that the pilot should not have to do anything but fly, and that all additional policies, programs, and procedures should be such that they should be provided. He cited as an example the problem of starting a jet aircraft where temperature of the start-generator is a limiting factor. Pilots expect permeable fluids to easily self-start, and so the Air Force is considering the use of a completely automatic engine starting system.

Smith said that much of the current outcry against computers could be traced to quotes from experienced pilots with long strings of combat missions in World War II and Korea. These men could probably use a simple switch panel, he said, but the new pilots couldn't. The new fighter groups will be doing most of the flying in combat of war, he added.

Lack of Capital Hits Aerocar Plans

Lack of capital has forced Aerocar, Inc., Longview, Wash., to drop out of the Civil Aeronautics Administration's program to put full-scale tests on double-deck aircraft convertible to auto-

CAA had asked the firm to supply 10 of its Aerocars on a rental basis, but the firm's president and designer, Michael Taylor, says he has been unable to raise the \$100,000 necessary. Aerocar is building four of its modifi-



ANGLED DECK on USS Forrestal will permit emergency landings after bad landings.

New Angle for Carrier Landings

A new type of flight deck and open deck technique has been developed jointly by the U.S. and British crews to increase efficiency and safety at jet aircraft operations aboard aircraft carriers.

The new deck has an additional and extending foredeck from the normal flight deck to allow the aircraft landing gear to be angled two degrees off the ship's centerline.

• **Optimum.**—This is how it works:

In current carrier operations, the pilot must fly straight for a landing at from 5 to 10 knots above stalling speed. When he is directly over the landing gear he gets a signal from the landing signal officer to "cut." The pilot drops his throttle and rolls down onto the deck where his tailhook captures one of the arresting wires. Then the pilot drops his throttle but is unevenly committed to land. If his tailhook misses the arresting gear he will roll into a crash barrier designed to keep his plane from crashing into the deck or the angled flight deck and serious piloted-on-the-ground damage is avoided.

For a jet-powered plane, the crash barrier can wait until catch the propeller. For a jet, a 130-ft. arrester bar must be used to catch the landing gear and wing. If the barrier fails to hold a plane, or if barriers ever, a cockpit crush into the planes parked forward.

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In the new technique the jet pilot approaches at an angle with his tailhook extended and pulling about 75% power. He comes in at a relatively high speed with the nose high to make the aircraft sink at a controlled rate of descent instead of slaming down onto the arresting gear, he "rolls" into it and doesn't need power until he feels his tailhook engage. If the hook fails to engage he removes his arrester bars, pulls the throttle forward and, since he already has considerable power, the jet

can accelerate fast enough to take off again and come around for another approach.

The conclusion of the angled deck and new approach technique offers the following main advantages, according to Rear Adm. T. S. Conklin, chief of the Navy's Bureau of Aeronautics:

- **Safety.** It removes the costly hazard of a crash onto the forward deck of a plane into the forward section of a parked and armed aircraft. A recent crash of the *Enterprise* into the forward deck of the angled deck, it is pointed out, may have been avoided.

• **Efficiency.** The time it takes the

plane to roll down onto the deck will be decreased when the landing gear is angled.

• **Economy.** The angled deck landing gear requires only half the arresting gear used for normal operations and eliminates the crash barrier. Observers estimate that about \$300,000 will be saved on arresting gear engines alone.

Considerable weight is saved at the critical area high above the plane's nose at g-force. Indications are that enough weight can be saved to allow installation of an additional catapult for landings on the angled deck.

• **Developed.** By British.—The angled deck concept was developed by the British at the end of World War II when they began operating jet-powered aircraft. Plans of the original concept are now lost.

The angled deck barrier test in these planes beyond repair. First flight tests were made in 1953 by U.S. Navy

planes off Norfolk, using jet aircraft on a specially modified portion of the carrier POK's flight deck.

Initial experiments on an angled deck as a landing site are being completed on the 27,000-ton *Essex-class carrier* *Attacker*. A full-scale fleet evaluation of the angled deck and its flight techniques is scheduled for early in 1955, with both British and American jet types participating. Cost of the Attacker modification is about \$1 million. If the Attacker tests are as successful as anticipated, all of the *Essex-class* carriers will be modified with an angled deck. On carriers with an inclined superstructure, the angled deck will consist of the port side. On the new *Shark*, 60,000-ton *Fleetwood-class* carrier the landing and angled areas will be angled in both directions.

Transistor 'Aging' Troubles Producers

Reports of "shelf-life aging" in certain types of point-contact transistors are attributed to one leading manufacturer to underestimate testing against wearout. The manufacturers say he steady but slow corrective steps he is taking to eliminate gas, or ammonia, reaction for the long-term of the required trouble.

Ammonia stability is seen as the transmitter as a possible inhibitor for the transistor tube has been high because of the transistor's extremely long life, small size, light weight and low power consumption. Although it is only removed out of the "laboratory extremely" range, more conservative should have put their engineers in work to learn more about the transistor's characteristics and potential uses.

• **Point Contact Type Semiconductor.**—The aging problem has shown up only recently in the point-contact type transistor, the earliest type of the solid-state device to receive production status. The point-contact transistor consists of a small piece of germanium against which are pressed two tiny wire "wet whiskers," called the emitter and the collector. Presumably, the emitter can respond to a minute total grid, the collector corresponds to the plate.

It has been known for some time that transistor occurs a chemical reaction at the point of whisker-germanium contact which increases collector impedance and reduces current gain. Extended storage periods have now shown that the plastic used to seal some types of transistor permits ammonia leakage. Hermetically sealed units are possible, but use of an anti-aging film is to be the best solution to the problem.

• **GE.**—Studied—In answer to an *AVIATION WEEK* query, a General Electric spokesman said: "Along with other

companies, GE has experienced a phenomenon similar to 'shelf-life aging' which has been traced to a lack of adequate protection against moisture at the junction between the whiskers and the germanium. Laboratory conducted studies indicate no evidence [thereof].

• **New conventional designs having adequate moisture protection are under way at the present time."**

A source at *Westinghouse* Electric and that approximately 15% of its type 1000 transistors have shown significant gas leakage to the input and output terminals in the last few years, due for a short time.

Although the semiconductor know-how has been available for some time to make

propellers that will carry aircraft up to speeds of Mach 1.5, nothing much has been done until recently about developing the high thrust turboprop powerplants or aircraft specifically designed for them.

Two new steps toward putting the turboprop out of the laboratory are now

in progress:

• **National Advisory Committee for Aeronautics.**—An NACA panel, headed by the *Whitney* Co., has been asked by the U.S. propeller manufacturers to make a detailed study of design parameters for a standard configuration for a high-thrust turboprop engine.

• **ANFAC and Navy.**—A panel of experts from the Air Force and Navy research units is engaged about the use of the

Turboprops

- **NACA and services seek better plane designs.**

- **Mach 1.5 speeds possible with present know-how.**

U.S. high-speed turboprop development, which has been lagging far behind in aircraft engine developments the last few years, is due for a short time.

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• **ANFAC and Navy.**—A panel of experts from the Air Force and Navy research units is engaged about the use of the

higher engine development at least of more powerful engines which will produce 15,000 hp, have substantiated development of such a powerplant. Accept *Panther-Belair* as developing more powerful turboprops the plane will be competitive in price with current turboprop engines but less expensive for the airframe and the first propeller-driven plane, U.S. military development has been concentrated on turboprops that little attention has been given to turboprop aircraft except for the *Allison T33* and *T40* and the *Patt-Watson T4* about five years ago.

As a result, aircraft manufacturers are designing high-speed propeller aircraft and are accepting penalties in the relatively low power (about 5,500 hp) of the two U.S. turboprops now in advanced development or limited production—the *Allison T49* and *T47* and the *Whitney T44*.

U.S. propeller engineers feel that data is available today to design propeller engines of propeller aircraft of 15,000 hp at Mach 1.5. This could be competitive with the fastest jet aircraft now flying, while providing sufficient fuel economy, better climb and climb performance and reverse thrust looking for shorter runway landings.

• **Conventions Planned.**—The first joint



NEW SWEDISH ATTACK PLANE TESTED

Flight trials were started Nov. 1 of the new Saab 32 Lansen, a 700 mph, two-seat all-weather plane designed primarily to attack ground and sea targets. Flash air intake feeds the powered Klimov R-28 engine. The Lansen's close links are further increased by its drooping swept wings and tailplane for mounting air flow at the root of the variable stabilizers. The flat wing is fitted with large Fowler-type flaps and leading edge slats and ailerons and elevators

are hydraulically boosted. Close missiles have ejection seats. Primary armament of the plane consists of cannons, but rockets and bombs also can be carried if the need arises. Nose wheel fairings and up, main wheels swivel.

at which jet engine laws stepped up their power and the military emphasis on speed, probably are primary reasons why some attention has been paid to the turboprop developments in the last two years.

The proposed jet planes have been planned for conversion to turboprops to test the propeller drive at speeds in the subsonic and transonic ranges. One of these planes, for modification of the McDonnell XP-83 for propeller drive in addition to its jet potentialities, has since been dropped. The other still has great Air Force and Navy interest for the installation of a turboprop in a special intercepting version of the Republic F-84.

Turbulence created in the nose of either of those fighters by the wake of a high-speed propeller would subject the aircraft to uncontrollable rough air conditions it would not fly in at a pass at.

A third proposed turboprop development at relatively high subsonic speeds calls for modification of turboprop engines in a long-range version of the Boeing swept-wing B-47 intercepting bombers.

► Status in Miscellaneous—Proposed engineers point out that installation of turboprop engines in pods under the wings, as would be indicated here, is far from an ideal arrangement. It involves either a noisy landing shock or propeller clearance for ground clearance or a ridiculous-looking long-legged and unstreamlined looker.

Returns to something like the Douglas KB-42 "Minuteman" configuration with the propeller at the tail of the plane will not have to fly through propeller turbulence, probably is indicated at least one preferred configuration.

While several other turboprop-driven planes are now flying, none in the high-speed categories which today's propeller design capabilities make possible.

Design trends for very thin straight-bladed propellers are now considered to be favored by the best aerodynamicists in leading propeller manufacturers. Additional test runs have indicated that the prop do not need to be so thin in the critical area near the shank and hub as was earlier believed.

Bell Copters Ahead

Foreign governments are using, or planning to use the Bell STOL helicopter in military as well as some civilian roles. India, Norway, Sweden, Denmark, Italy, Chile, Belgium, France, China, Netherlands, Philippines, Argentina and Canada. In addition to military assignments, the copters are used in postal routes, ambulance duty, port control, power line patrol, map survey and exploration.

Fifty Years of Powered Flight

Plans for a year-long observance of the 50th anniversary of the Wright Brothers' first flight was revealed in Washington last week by James Howard Jimmy Doolittle, who will head the program. The 50th anniversary of flight observance will begin Dec. 17 at the Wright Memorial dinner in Washington, and continue until the same event in 1953.

Doolittle, who will assume the 1952 Wright Brothers Memorial Trophy for his contributions to civil aviation (Veterans Week Nov. 17 p. 12), will head a committee of approximately 100 leaders in all phases of aviation to plan the program. Committee headquarters will be in Room 653, Sherman Building, Washington, D. C.

Goal of the committee is to organize a national tribute to the pioneering achievements of the

Sen. Bridges Calls For K-F C-119 Probe

A Senate wing of Air Force's contract with Kaiser-Fresno Corp. for production of C-119s early next year is being questioned.

Charging that the unit cost being paid to the firm of \$1,200,000 compares with \$360,000 being paid to Fairchild Engine and Airplane Corp. which originally developed the aircraft, Sen. Wayne Morse has called for a thorough investigation by the Pentagon's Sub committee of the Senate Armed Services Committee. He also signed the Senate Appropriations Committee to review the contract in connection with 1958 fiscal year funds for the Air Force.

Bridges, who is the top-ranking Republican in all three groups, is taking the lead in the congressional drive to bring the leading propeller manufacturers. Additional test runs have indicated that the prop do not need to be so thin in the critical area near the shank and hub as was earlier believed.

Design trends for very thin straight-bladed propellers are now considered to be favored by the best aerodynamicists in leading propeller manufacturers. Additional test runs have indicated that the prop do not need to be so thin in the critical area near the shank and hub as was earlier believed.

► Comptroller Cost-House Arouses Scrivener, which already has made a thorough investigation of the contract, refused to discuss the matter. Scrivener said that it had come down to a question of the price of whether the military should open up second and third sources of supply. The policy is generally favored by the military services and members of congressional commit-

tees concerned with military aircraft.

The gist of the Air Force statement appears to be that K-F has had no experience in the aircraft industry and must necessarily undergo huge initial costs," Bridges declared. "That explanation can be considered a strong argument against the contract either from the standpoint of economy or from the standpoint of encouraging it. I believe most people would agree with me that a good deal of the Air Force procurement officials in the field instinctively let it follow with knowledge how to fulfill them properly and at the best price to the government."

Bridges said that the K-F contract for production of C-119s also should be investigated "to see if it exceeded the same excessive costs. I am as much at odds with any company while established plane builders have created capacity."

► Probe Outlined—Senate investigation should go into Bridges stated, as to whether the Thunder plant at Bakersfield, Mo., can possibly be held up by the K-F contract. The K-F model is receiving production orders, whereas it is possible for one cause or the other to end the K-F contract. Whether Air Force has incurred excessive costs in other areas of supply for airplane production, whether USAF's military concern coincided with the decision mentioned in letting the K-F contract.

Jet Overhaul Base

A jet aircraft overhaul base has been dedicated at Ontario International Airport, Ontario, Calif., by Lockheed Aircraft Service.

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By-Pass Engine Promises Fuel Economy

- This powerplant looks good for transport types.
- It offers low-cost high thrust for climb, cruise.

The by-pass, as distinct, jet at first and foremost a design for fuel economy.

It is a way of obtaining high thrust with low fuel consumption, and as a secondary advantage, a high thrust for initial and climb.

It is no way of concern to aircraft designers who are after high speed alone.

Historically, the bypass engine is a jet engine which incorporates a ducted fan or primary air compressor. As defined in Sir Frank Whittle's basic patent, airflow from the fan is bypassed, compressed bypass-turbine engine, and a by-pass duct around the engine to an exhaust outlet concentric with that of the turbine.

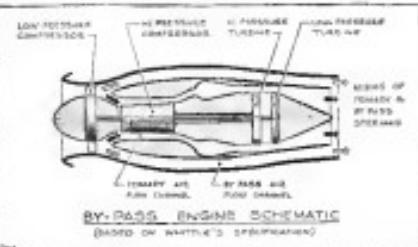
In its original form, Whittle's patent (British No. 471,651) disclosed the compensated engine, such as the Nippor Nomad, and the use of afterburning. The patent, filed in 1936, was recently renewed for the maximum extension period of 10 years after a legal fight by Power Jet (Aerospace and Developments) Ltd., holders of Sir Frank's patent.

Whittle's later U.S. Patent 2,162,725, also similar to his 1936 World War II, but the claims describing the compensated engine were omitted from this application.

► Early Engagé—Whittle was first to propose the bypass method of raising propulsive jet-exhaust flow. But the first to put the principle into practice may have been the German Daimler-Benz company, which had the D.B. 607 engine running in the autumn of 1943. This design was, however, considered too complicated by German authorities and was dropped.

Judging by the French Société Borealis, under the guidance of M. Aeronautique, state-supervised designer, started work in 1948 on a by-pass jet. Development continued in secret during the German occupation and Borealis had engine running in 1946. That S.G.S. (as S.R.A.I. was then known) jet had a specific fuel consumption of 1 lb/lb/h, which was good for a development engine of those days.

In order to give high takeoff thrust, that is to get a large sum of air moving, the bypass has to accelerate it to a very high speed. This means burning a great deal of fuel—even a pound for each



Power Jets Ltd., the government-supported company established to supervise British research and development and the application of Whittle and other patents, started work in 1945 on the idea, in an adjustable bypass unit. This engine, well under construction in 1948, was dropped down, under pressure from the British engine industry. Power Jet stopped active design work in favor of advocacy duties.

Recently, the French Société Turbomeca has built down its small by-pass engine, the Agora, with considerable success and with reasonably low fuel consumption.

It is interesting, and that the British Marconi Vixen F.4 engine with ducted fan three-compartment engine, was built at the exit of the nozzle driven by an entirely independent turbine mounted downstream of the main turbine—was built by press design, but British parts suggest it was not. The point at issue is that it can run the fan more accelerated by the fan is independent of that controlled by the compressor, and that to qualify for the title by-pass there must be a splitting of a common air supply.

► Behind the Theory—The by-pass principle is simple enough and depends upon the fact that, assuming that the mass of the air can vary only as the speed of the stream, the greater the air-propulsive efficiency. Until it is traveling very fast, the straight jet is not efficient because of that "clip."

In order to give high takeoff thrust, that is to get a large sum of air moving, the bypass has to accelerate it to a very high speed. This means burning a great deal of fuel—even a pound for each hundred pounds of thrust, at least. (Because of the compression of a piston engine, one can get very little fuel per hundred pounds in such an low cost, period of fuel.) Already, fuel consumption of around 0.3 lb/lb/h is contemplated for the by-pass engine, which means very high fuel miles per gallon in the atmosphere.

The bypass engine is a way of improving the air mass flow, but it adds off the compression and weight of a high reaction gear box and a propeller. There are also the attendant difficulties of starting, and the provision of long-path passage and reverse flow, and reverse flow in the propeller controls. This will be affected because of engine "fidelity" and departure drag and, of course, there is the longer (and heavier) undercarriage needed for pressurized aircraft.

► Better Composites—The bypass engine, and the duct fan, are strengths in getting the best from both systems. British authorities who believe in the bypass principle claim that it is aerodynamically simpler than the large turbofan and is therefore lighter and more reliable. It is possible to reduce fuel or to lower the air mass flow of a straight jet for the same fuel consumption.

The reason for this is that the first few or four low-pressure compressor stages may give a pressure ratio of 1.5:1. The flow from this is then split. The ratio, probably 60:1, comes through the high pressure stages, with a ratio of, say, 4:1 going over all pressure ratio of 61 (4 x 1.5). Meanwhile, the by-pass air masses work best

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Franklin-Powered Helicopters hold ALL WORLD'S RECORDS for speed, altitude and non-stop distance



On September 17th, 1952, a Franklin-powered Bell H-13S helicopter, flown by Captain George Dillier, took to Niagara Falls, N.Y., a distance of 1317.43 miles, in an elapsed time of 32 hrs., 31 mins., 30 sec., breaking all official and unofficial records for helicopter distance flight.

On September 17th, 1952, a Franklin-powered Sikorsky S-52 helicopter established a new world's altitude record of 21,359 ft. and a new world's speed record of 128.605 mph. These records still stand unbroken.



AIRCRAFT MOTORS, INC. SYRACUSE, N.Y.



from the engine body and in the pressure chamber. Heat energy, below being discharged at the rate of the revolution. In addition, the "Sik" is a racing aircraft engine, built as a small jet and, mixed with the exhaust gas, has much better propulsive power at low speed because of the reverse of slope. Above all, the bypass is a method for shortening a device that can in Whittle's original patents because of the large quantity of exhaust air remaining.

■ **Application:** British opinion, naturally exemplified by Boulton-Paul, because of their work in the Company, at least the bypass engine, is ideal for bombers and transports operating in aircraft such as the Vickers in the Canberra IV. The aircraft, for takeoff and climb are undelayed, with or without afterburning, and fair improvement in nose-low is particularly valuable for cruise economy at 50,000 feet and above.

Installation clearance of the bypass engine is in its favor for high-speed cranking, and there is no reason why overall clearance should necessarily be any larger than for an equivalent straight jet. The cooling ducts of an air way will reduce structural problems associated with supports because of their number from high thrust areas.

The first few generations of composite engines can be driven either by gears or by using a bypass layout, the latter possibly being the simpler. In the Daimler-Benz Arocs, variable incidence entry guide vanes are used to insure the most economical airflow for given speeds. This feature is presented in a "Virtue" by designer Joseph Szydlowski, but is more probably a mystery.

Although the Arocs is an excellent example of a pure ramjet and deserves high credit in being the first to achieve flight, tests were made in a Farnborough wind tunnel.

■ **Design:** One reason against the bypass engine proposed by technicians of next engine design franchises may be summarized as follows:

• Operating breakdowns are anticipated. The bypass engine is a more refined design problem, depending more on ambient conditions than does the straight turbo jet. New conditions, or changes in atmospheric demand, demand a complete redesign.

• Drive mechanism is complex. The two-piston, belt-and-chain layout is already hard enough to work with, and the British design teams.

• Ducting installation is complicated. It involves splitting an air supply through ducts, mixing it with fuel, paper and after plumbing.

• Mixing of jet streams is tricky. Interference and sonic problems of such an installation are not completely known, let alone studied.

■ **Rebuttal:** Proponents of the system



Exposure protection: Autopositive reproductions are used in place of direct drawings which would otherwise be exposed to constant wear and tear. These intermediates—with dense photographic blackouts on a durable, white paper base—guarantee sharp blueprints whenever needed.



Photo heating film: The exposures and other exposures necessary for Solvay's offset plants to Leykam, Detroit, and Ennis, Texas—are provided by the famous "heat film" Mylar, which is a thin, flexible, organic material which, like the latest qualities of photographic, are available for future reference and protecting reproduction.



The Solvay Process Division, Allied Chemical & Dye Corp., reports

New speed and versatility in drawing reproduction ... with Kodagraph Autopositive Paper

Drawing duplication simplified... print deliveries speeded... new reproduction services provided—these are some of the advantages Solvay Process is making with Kodagraph Autopositive Paper.

The new photographic intermediate material reproduces all types of drawings and documents directly. In addition, Autopositive increases the utility of existing print-making equipment... brings the "print" features offered by photography closer to many jobs. See how it works for Solvay... see how it can work for you!



Codex reproducing alternative: Old, costly, time-consuming methods of Kodagraph Autopositive Paper, which introduces this coded, electro-type background... producing "newsprint" print-making masters without costly embossing.



Costs reduced: Autopositive intermediates for prints are sent to provide leaders to plan construction projects so that the required number of blueprint sets for questions can be made. The same time previously lost when sufficient quantities of prints were required.



Plans copied quickly: Autopositive intermediate sets used as "masters" from which the required number of blueprint sets are made. These intermediates can easily be erased, cleaned and used again, and new drawings can be added... by hand or typewriter... so that the basic documents can be used over and over.

Get complete details: on Kodagraph Autopositive Paper. Write for a free copy of "New Short Cuts and Savings."

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Kodak
TRADE MARK

over distances from 15 in. to more than 100 ft.

With self-alignment, an angle of the scope objective to the reference line of the water target and of the target is out of square, the scope will be out of center. A built-in dial goniometer and rule-based graphic (menu) enable the operator to determine target alignment errors.

Scope's barrel diameter is 20 in., magnification is 30X and 40X. When encounter reading of displacement is not required, the scope is available with out built-in optical reticule.

Another TBI unit offered by Enga is in octagonal tube for precise point and TBI alignment. This has the same dimensions as the scope and incorporates two chromed targets at 10 in. distance. Total scope alignment is established when both targets are aligned on the scope.

New TBI targets available are 144- and 240-in. hard glass units, made to Aircraft Industries Corp. standards. Other accessories include collimators mounting spacers, target rotators, optical spacers, and scope shade cover, as carding to the distributor.



Shipping Unit Saves Missile From Shock

New spring-loaded mount has been designed to protect guided missiles against shock and vibration in shipping.

The basic design would be tailored to fit a specific missile, such as the dummy body shown. Springs on the fast and off rings carry the load and are compressed from a neutral length of 8 in. to 6 in. for a period conducive to break their natural frequency. Radial pressure of the springs is placed in 60 deg semi-circular cuts to act against an opposing camber. Rings containing the tensioner are located at both ends of the shock mount.

Shock mounts have been used in the space race as well. Credit goes to open ring tensioner for insurance and removal of missile body. Dolly wheels are quickly removable and come separately, missile and engine, could be shipped in a container-ization being carried in container flat, the missile slid in, and restraining closed. Patented on the design is held by Mechanical Structures Inc. Ltd., Westbury, L. I., N. Y., which is now in the licensing operation. The company will also supply prototype or production models, if requested. In addition, it can manufacture any part chosen, a solid ring type mounting shell has been designed by the company, as well as sprung loaded mounts for various electronic-type controls.

Front was licensed by major factors of the missile assault on Mombasa, Kenya, Westbury, and Hammond, Mich. Pasadena, Calif.

Armour Announces Plane Film Plastic

A new low-density material, reportedly being sold to U.S. aircraft manufacturers to reduce the weight of aircraft structures, is available from Armour and Co.'s Defense division, 1555 W. Hubbard, Chicago, Ill.

Known as Armourite, the substance is a foamed-in-place, self-curing ex-

panded polyisobutylene as a two-part liquid formulation. A sample catalog, "Armourite," was released at Aviation Week Oct. 27, p. 35.

Characteristics include stability in air flow, and vibration damping, together with affording a right bend on sets, wood, glass, plastic, fiber, cloth and porcelains, as well as good thermal, sound and electrical insulation properties.

The material is reported to last many years in heat, and is moldable in water. Density can be varied from 1 to more than 25 lb per cu ft, as desired.



THE TBI unit is here ...

Landing Shimmy Is Studied at Lockheed

A huge tremor in basic control of Lockheed Aircraft Corp. helpings seems to have been the responsibility of landing gear shimmy. Instead of attacking gear to withstand vibration, Lockheed wants to eliminate possibility of damage to landing gear in future experimental planes.

With the new research work installed, in effect, a continuous survey, Lockheed is aiming to achieve better integration of landing mechanism into new designs. Testbeds and testings will be conducted for planes as large as the Super Constellation, with speeds of 600 mph to transonic.

Landing mechanisms for two experimental plane already are scheduled for types to be the design some time this month.

Key part of the test equipment is a 10-ft-diameter rotating drum operated to simulate speeds of the landing or takeoff conditions desired. The drum can be rotated with constant speeds to simulate two characteristics on rough surfaces. Maximum surface speed of the drum is 150 mph. Loads applied to wire grids under test may run as high as 150 tons.



to specifications

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GUTAWAT of DH prop for Saunders-Roe Princess shows internal mechanism which achieves propeller pitch change as high as 321 degrees per second.

Proteus Prop Changes Pitch Fast

New de Havilland blades, now flying on Britannia and Princess, can reach rate of more than 32 deg./sec.

A system which produces pitch changes greater than 30 deg. per second is the outstanding design feature of de Havilland propellers built for the Royal Air Force's new jet-powered aircraft.

Now flying in both the British Royal Air Force four-engine transport and the Saunders-Roe Princess 16-engine flying boat, the new propeller represents a high mark of DH technical effort in jet engine design.

Hollow steel blades (the first developed since DH entered the Hawker Siddeley division of United Aircraft Corp.) used on the Britannia, flat blades are used on the Princess, but will be replaced with steel units when higher-powered Proteus engines are installed on the plane.

Design Problems: The free rotation of the Proteus makes for fewer problems for the propeller designer than does the shaft-coupled turbina type.

One big exception has to do with the aerofoil and of a free-turbine engine. These engines give a sudden surge of power when the turbine is exposed, forcing the propeller's constant speed unit to act very quickly and accurately to handle the rapid increase of power.

DH's first attempt produced a propeller unit with a fluid capacity of 3,400 gph to supply the pitch-change mechanism at maximum engine rpm (largest unit at six at the time of this development had a capacity of 400 gph).

This rate of delivery was inadequate so DH turned to a different approach.

Final form of the speed control was a high-capacity pump with an acoustic acceleration-consumption device to handle high accelerations. Signal to that unit comes from the 3-phase engine-driven tachometer-generator on the Proteus. Engine acceleration is measured and compared to a preset value; if the ac-



PROTEUS PROPF is heat-treated for strength and hydrodyne checking. This two-blade propeller contains clipping for bursts of electric current for detecting bowed propeller blades. Separates wing support casting for nose blades.

celeration exceeds the preset value, full delivery of fuel is switched to the pitch change unit.

Pitch-change rates as high as 321 degrees per second can be obtained, which de Havilland says is nearly twice the rate of pitch change of conventional systems.

Feathering: Push pull buttons further the Britannia and Princess propellers feathering takes about ten seconds.

On the Princess, the coupled propellers are not arranged to feather independently, because a power failure of one of the coupled engines would change the gearing so that the propeller still can not be driven by the good engine.

There is enough capacity in the constant-speed units to eliminate the up-sets occurring groups. For emergency feathering, one pulled back and up over a gear, the remaining three slowdown to deliver full output of the constant speed unit to the prop. The rate of pitch change is such that reverting can be accomplished from cruise power without danger of overspeed as the blades pass through zero pitch angle.

Automatic synchronization has been tested by DH on a Hawker-PAGE Hastings aircraft, a de Havilland Comet, and a British Lincoln freighter. Right now synchronization is not a feature of the Princess and Britannia.

If the hydraulic supply to the propeller fails, there is a device which locks the blades immediately at the angle at which they are operating. This keeps them from returning to the low-speed stop and destroying the very high wind making speed and drag at which the fast fuselage is particularly susceptible.

Dodge Plant to Produce Propellers

Propellers are scheduled for production early next year at Chrysler Corp.'s Dodge plant, San Leandro, Calif. Core prop will make 160 ft diameter, four-bladed, rubber-faced Hawker Standard propeller under license for Air Force and Navy, in a new plant addition. The facility will have a production control laboratory for check on material from raw stock to finished product. The lab will be devoted primarily to certifying civil work, but will also cover rubber and other materials.

Japan Study Jets

A Japanese firm recently is drawing up plans for a new, lightweight but powerful jet engine which is intended for completion in two years. The manufacturer, Gantayi Fuji Industrial Co., is collaborating with Sumitomo Metal Co. on production of last-chamber steel to be used in the powerplant.



scorpion with deadly sting

Designed to find the enemy in darkness or in storm and to deliver the deadly sting of six 20-mm cannon, the U.S. Air Force's Northrop Scorpion F-89 places great emphasis on materials that provide utmost strength while cutting weight to an absolute minimum. Northrop Aircraft, Inc., Hawthorne, California—producer of the Scorpion—meets this need with Cortico Aircraft Tubing.

Specially formed and machined qualities make Cortico Tubing the best material obtainable for landing gear, fuel lines, and

many other applications. The first "Cortico-Mary" ever made for aircraft use was developed and produced by Cortico, and today OBT000 supplies tubing to the majority of leading aircraft manufacturers.

Cortico Aircraft Tubing meets Army, Navy and AMS specifications. Send for free Handbook A-2 packed with facts for ready reference on Cortico Aircraft Tubing. Airframe Stock List (revised bi-monthly) also available. Address your nearest Cortico Sales Office or write direct to General Office, Shelby, Ohio.



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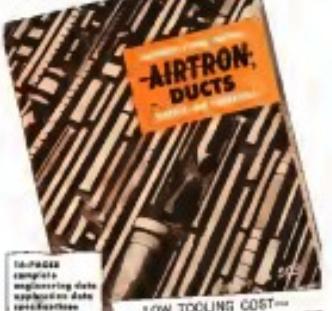
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oxygen, and ozone picked down. While under the extreme vacuum, the enclosure and seeds are tested for leaks by means of a Mass Spectrometer—a device so sensitive that it can detect a leak so tiny that more than thirty- α years would be required for one cubic centimeter of air to pass through it. This highly refined method of leak testing causes rejection of many enclosures which could pass the usual immersion tests without detection.

For most applications, the enclosure is then filled with dry nitrogen, which has a relatively high atomic potential.

IN THE fourteen years since CLARE first began the development of hermetically sealed relay for telephone, military and industrial use, CLARE has developed over 30 different series of hermetically sealed relays.

Each series works to the size of the container, the number and kind of instruments, washing facilities and the type or types of stains which can be sealed off. Within each series, reasonable variations of relay and contact specifications are possible.

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Illinois. In Canada: Canadian Zinc Materials Co., Ltd., Toronto 13.
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PRODUCTION



MAGNESIUM casting made by Boulton & Paul for B-47 tail control system.

Stratojet Has New Tailcone Unit

Photo of new tailcone for the Boeing B-47 bomber indicates that the tail fairing is a sub-assembled. The fairing is triggered by what looks like a ram-air, this coupled with the fact that General Electric is producing the system at a manufacturing plant B-47 stabilators (supplied by USAF) as a pre-tying-in type, lead to the conclusion that the tail fairing is sub-assembled.

The new tailcone assembly is made almost entirely of magnesium by Boulton & Paul, Ltd., Dunstable, which ships it to GE's Aerospace and Guidance Systems division in Schenectady for installation of the tail control system. GE

assembles wings and tails the first time in its tailcone assembly by fastening it to the surface manufacture. This is believed the first time an aerospace manufacturer has provided that portion of the aircraft which houses his avionics equipment.

The tail fairing is a sub-unit of the stabilizer and "de-tails" fairing. First at the B-47 plant in Wichita (Kans.), T-33 at Memphis (Tenn.) and T-38 at Tustin (Calif.).

Among advantages listed for Polyphatex MC moldable is qualities, low viscosity in the molten state, thermal stability to temperatures high enough for polymer line molding and precipitation polymerization.

Another unique method of applying the solution is in a vacuum pressure tank.

With various established, solution is

coated under a pressure head of 100 psi, with the result the resin is both

coated up and forced into parts.

The process is handled by licensees,

with service now available in Los Angeles area.

Where a plant is in a large area of refrigeration, it may set its own license for the process. System is the property of Polyphatex International, Inc., 401 Madison Ave., New York.

Willys Gets New Big Forge Hammers

Two giant forge hammers of the same additional units scheduled for operation under the expansion program of Willys-Overland Motors, Inc., Toledo, Ohio, have gone into operation. The two new hammers will be used to produce aircraft and engine castings for jet planes.

When the expansion program is completed next spring, the new additional hammers will add more than 100 cubic ft to the yearly production potential. Program is expected to

be completed to about 1,000 cubic feet per year.

Sealant Saves Porous Castings

A new service for filling and sealing magnesium castings in foundry operations to lower the cost of aircraft castings. The service, available from licensees of Polyphatex International, Inc., New York, has a new penetrating resin, Polyphatex MC, and special equipment to save the porous casting from the strip line.

Salvage to reduce scrap castings

can be carried out on a production line basis with greater certainty that all parts produced will be sound. Polyphatex says, resulting in lower cost quoted on casting jobs.

Castings made at the plant, as reported in aluminum and magnesium castings, since magnesium castings are most prevalent in jet aircraft models. Casting tested up this way can also be an indicator of casting of high strength materials, such as the magnesium and such heat-prone, volatile substances, as dodecane vapors, mica parts, and other materials.

Among production items which have received the treatment are a complex magnesium aircraft engine control casting, magnesium seats for the control station, aircraft components, and a cast aluminum alloy casting which is used for carrying carbon dioxide for in-flight life sustainers.

The Polyphatex process uses a catalyst which polymerizes the resin into a solid. Previous methods required long exposure times, which was often caused by the water (watercraft) component, leaving voids where the solvent should be the company says. The new method permits, for the first time, a rapidly 100% filling job. Polyphatex claims.

The cured resin, a thermosetting brittle material with temperature of 750°F. While it is hard, it retains enough resilience to allow for expansion and contraction of the metal.

Among advantages listed for Polyphatex MC moldable is qualities, low viscosity in the molten state, thermal stability to temperatures high enough for polymer line molding and precipitation polymerization.

Another unique method of applying the solution is in a vacuum pressure tank.

With various established, solution is

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with service now available in Los An-

geles area.

Where a plant is in a large area of refrigeration, it may set its own license

for the process. System is the prop-

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PRODUCTION BRIEFING

► The Lee Co., Hartford, Conn., maker of aircraft and solar control components, has purchased a casting facility in Westfield, Conn., increasing production capacity by 45%.

► Radle Corp., South Bend, Ind., has delivered its first J47 jet engine to

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the Air Force for B-47 test flights. Designated 347-8125, the powerplants are being built under GE license.

► Malloy-Shaw Thorne Corp., Nitro, Ohio, has opened a West Coast office at 1338 So. La Brea St., Los Angeles, with George H. Dewey in charge.

*Bausen Art Metal Works, Inc., Newark, N.J., has acquired a \$2,000 sq ft plant to aid in defining work production expansion.

• **Stihl Corp.**, is the new name of Stihl Inc., Inc., Chicago, maker of portable and pneumatic tools.

* Edelkem, San Leandro, Calif., Transocean Air Lines subsidiary has been named U.S. distributor for Wynn d'Ortiz Chemicals Corp. Rights in several foreign countries are included.

► Westinghouse Electric Corp's E&I arm division, has received a \$3 million Navy contract for installation of single-aisle aircraft elevators on the super carrier USS *Enterprise*. The elevators will be 60x60 ft.

USAF CONTRACTS

Following is a list of USAF contracts recently announced by Air Material Command:

Berman, Frank. *Baruchis*. 1711 Broadway, New York 10019. Combination of a writing project and a social cause.

Metaphysics Address: 1000 Queen Street West, Toronto, Ontario, Canada M5S 2C4, telephone 416-595-1154.

Swanston Hermitage, Swan, Tasmania, south

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minister, whose wife has no name mentioned
in his will. His wife is Wesleyan.

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2000-2001, *Journal of Health Politics, Policy and Law*, 26(4), 814-8174; *Supplements to Journal of Health Politics, Policy and Law*, 26(4), 814-8174.

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- **INDUSTRIAL**, types 103 and highly sensitive, fast-response, low-voltage, series 103 (103A) and monolithic (103B) versions of this field and new top selling Bridge®. These surface-mount packages provide a first hermetic seal for chip, position indicator, etc. Shells are lead-free, finished in cadmium plating and bleached tin/lead; coupling pins or pins in natural finish. Datasheet update or catalog part numbers.

Bayonet type holding fixture provides ultimate strength. Fixed 1500N (441 lb.) available in 3, 6, and 12 mm. sizes, with one plug style.

• GUT® plugs have a steel shell and "BELCAN" insulated cable relief and mounting terminal sleeve.

• Bayonet type holding fixture provides ultimate strength. Fixed 1500N (441 lb.) available in 3, 6, and 12 mm. sizes, with one plug style.

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After repeated failure, the second shop recommended Class H insulation. The first of these motors to be reconditioned with Ethiconen (Class H) insulation has now been subjected to such service for more than 2 years. During that period, the windings were exposed 4 hours to temperatures 10° beyond the limits of any other class of insulation when the motor was accidentally stalled by broken armature bands. Four times it was simply rebandaged, coated with silicone varnish, baked and quickly returned to service.

That kind of performance in thousands of installations proves that Class B insulation has 10 to 100 times the life expectancy of the next best class of insulating materials, withstands high ambient temperatures, requires no service, sustained overloads, and excessive moisture for long periods of time. It pays for itself over and over again in increased productivity and lower maintenance costs.

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E. L. BOSSEN MANUFACTURING COMPANY

卷之六 丁酉年 九月廿二日 34

THE G.W. HUNTER MANUFACTURING COMPANY
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Monei

a tough general-purpose alloy
to keep in mind for use where
corrosion resistance must be
combined with high physicals.

If you were asked to list the requirements of an ideal alloy for general non-structural aircraft use, you'd probably get down:

- * Resistance to corrosion
- * High Strength and Toughness
- * Hardness
- * Heat Resistance
- * Ductility
- * Good working properties

You can add to this list, of course. You might, for example, include good impact resistance or spring properties among the things you consider important. You'd find all these characteristics — and others, too — in the nickel-copper alloy, Monei.

A simple, solid-solution alloy, Monei is resistant to corrosion by aircraft fuels, salt water and other extremes.

Monei is stronger than mild steel. It retains its strength up to about 900°F and useful strength up to 1600°F, has good resistance to fatigue, and increases in strength at sub-zero temperatures without significant decrease in ductility or impact strength.

Like most nickel alloys, Monei is readily workable. It can be fabricated into any equipment which can be made of steel.

Forging, machining, and tube pipe bending, welding, braising and soldering can be handled by methods in everyday use. Through all manufacturing



This Selected Analysis Tool. There are important working parts of a retractor that require high strength, ductility, toughness from overall goodness. Below (bottom of the page) is a float like the one shown above (left downward), a typical valve disc of Monei (center). Monotoring and reverse switching, the Monei valve disc provides a pinching action, leak-proof seal. The strong, tough Monei retains superior qualities and controls, stemming the flow and keeping oil dirt and grit.

and fabricating operations, and throughout its service life, Monei retains its essential characteristics.

Because it offers all these advantages, you can see why Monei is a wise choice for the float discs and valves pictured above. They are vital parts of a retractor developed to remove dirt, grit and water from aviation fuel before it goes into the planes. The Monei parts not only give trouble-free service, but they also provide a safeguard against fire. For Monei, in addition to its other characteristics, is low-sparking.

There are probably many places where you can put such an unusual combination of properties to work. Keep Monei in mind for applications where its qualities can simplify fabrication operations, reduce maintenance problems or contribute to safe safety.

You'll find detailed information about Monei (and its companion alloy, 28® Monei) in our 38-page reference manual, Engineering Properties of Monei and 28® Monei. We'd be glad to send you a copy — without charge or obligation. Just write and ask for Technical Bulletin T-6.

Meanwhile, we hope you'll remember that Monei — like all Inco Nickel Alloys — means extended delivery because of defense needs. When you order, therefore, it's important to include NPA rating and complete end-use information.

SHEAR STRENGTH OF MONEL K500 WIRE

Specimen after % Reduction of Area	Shear Strength, psi Tensile Strength, psi
None	46,200 46,500
1% Red. before testing	45,000 23,100
2%	37,000 27,200
5%	33,000 34,000
24 hr. at 400° before testing	38,200 40,500
10%	31,000 36,000

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MONEL® — 70% NICKEL + 30% COPPER
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AVIATION WEEK November 24, 1962

Republic Open House



MUNIZ PEALE, president and general manager of Republic Aviation Corp., looks at the flight simulator E-10, mounted on pedestal for display during company's annual "open house" at Farmingdale.

MOBILE TRAINERS, such as the fuel system and various electrical, air conditioning and hydraulic systems in the E-10G are built by Republic's Pb. Working in liaison with designers to adapt them to NATO and USAF uses in Europe. The trainers are specially designed for air shipment.

PRODUCTION LINE of sweptwing F-105 is in full swing at Republic's Farmingdale, N.Y., plant. The company has orders for an additional number of the jet fighter-bomber-scout plane, powered by 7500-lb.-thrust, Canadair Wright-Jet 301 Superturbo. The J is designed for medium-level, low-altitude bombing; its bombs are dropped from the upper surface of the wing from the leading edge, where it was on the earlier G model.



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You've heard so much about aircraft oils you probably want to know which one is best for your own engine. Good idea. You'll fly more safely, no matter what type of engine your plane has, if you use the right oil for your engine type. For example:

Horizontally opposed engines need Gulfpride Aviation Oil Series-D!



Here's the world's finest detergent-dispersant aviation oil. It's made exclusively for use in horizontally opposed engines. Because it is put through Gulf's exclusive Akkrol process to remove extra amounts of carbon and sludge formers, Gulfpride Aviation Oil, Series-D, prevents ring and valve sticking... maintains a cleaner, better operating condition longer.

Actually, users have increased periods between engine overhauls as much as 200% with this great oil!

For radial engines or where a detergent oil is not desired, use Gulf Aircraft Engine Oil Series-R!



Assures superior performance in radial engines. Especially recommended for maximum operating periods between overhauls, it may also be used in horizontally opposed engines when operating conditions do not require a detergent oil.

A fine-quality, non-detergent, straight mineral oil, Gulf Aircraft Engine Oil, Series-R, is highly effective in retarding sludge formation. Maintains its body at high operating temperatures, too.

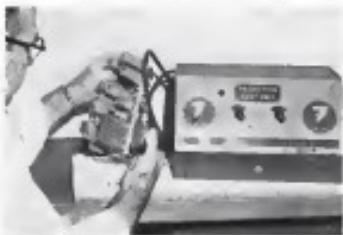
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AVIONICS



FAILURE PREDICTOR developed by Bureau of Standards depicts an inverse relationship between life and performance, shown at right.

Search Is on for Electronics Reliability

NBS device will improve equipment dependability by foretelling breakdowns, conference hears.

By Philip Klim

Chicago.—The number one problem troubling military electronic designers today is that of obtaining greater reliability, perhaps from the recent three-day National Electronics Conference held in this city.

The technical status on television, which had been last year's dominant feature, was not covered. What did receive particular attention, however, was the concern over reliability, and its reliable margins, as applied to military aircraft, missiles, and space vehicles. All these held on the same theme: An estimated 500 people concerned over the standing room to have papers on reliability.

► **Answers Highlights**—Equipment and techniques of special interest in the avionics field included:

- Portable failure predictor to forecast approaching equipment failure.
- Techniques for detecting early formation of volatile water vapor deposits before it causes system total failure.
- Short-life testing method for components in low- and beyond normal temperatures.

► **Concerns**—including lenses to speed up an electron and ionize ammonia without failure, their base pruned to make them taller and not grow too wide from the bottom; and the meaning, of course, they haven't determined too badly in performance. The failure predictor could identify "faulty aged" tubes which were still in good operating condition and allow them to remain in service.

► **Front of the Padding**—NBS tried the experimental failure predictor on an 18 stage radio receiver which was subjected to 1,000-hour accelerated aging tests involving temperature and voltage cycling. At regular intervals the material was checked with the predictor.

The device enabled NBS to spot about 75% of all tube failures miles before they actually caused equipment failure. J. H. Meier of NBS said.

This represented 95% of the short-deterioration type tube failures which are possible to predict.

The 16 failures which the predictor might have caught, he didn't include:

- Two tubes in "non-critical" stages not being checked.
- Four tubes in a single stage where

component failure such as structural failure in a vacuum tube.

The predictor was left unmonitored most of the time of a diode, in which vacuum tubes should be completely replaced at regular intervals. Main replacement is intended to avoid failure due to deterioration. However, it does so at the risk of introducing more sudden death type failures.

Most sudden death failures occur during the first few hundred hours of use, when tubes reach "middle age" without failure, their base pruned to make them taller and not grow too wide from the bottom; and the meaning, of course, they haven't determined too badly in performance. The failure predictor could identify "faulty aged" tubes which were still in good operating condition and allow them to remain in service.

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DESIGN STAFF ENGINEER

Transmission

MECAIR engineers in aircraft mode studies transmission design, including no torque hydraulics and transmission operation. Helicopters in flight or processor control. Requirements have caused design of a local system to eliminate design problems with remote mechanisms. A degree in mechanical engineering is preferred. However, equivalent experience will be accepted.

DESIGN STAFF ENGINEER

Electrical

MECAIR interests in aircraft electrical systems. Aircraft experience required. Experience in electronic systems including power and motor drive controls. Automatic pilot and autopilot systems. Work will include the evaluation to direct application of a small design staff, consulting of electrical and electronic engineers, and liaison with the aircraft testing department. Design or alternative engineering proposed. However, equivalent experience will be accepted.

INDUSTRIAL ENGINEERS

INDUSTRIAL or environmental engineering degree is required; plus experience in analyzing manufacturing problems, industrial methods studies and work analysis, process planning, tooling and cost reduction.

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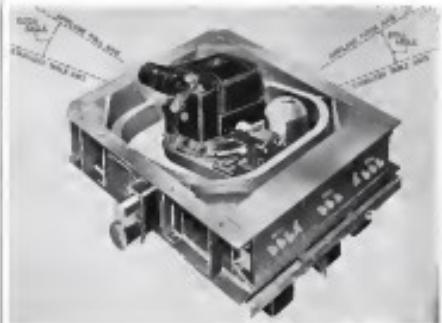
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PLATFORM developed by GoodYear Aerospace Co. keeps circuit level aligned in atmospheric oscillations generated with the measurement.

• One rule which change in characteristics was made by a change in the value of an overdriven resistor.

Of the rule changes which were not potentially preferable, all were either open or shorted leading, both of which occurred during a single hour of operation. There were insufficient failures of components other than fuses, Money said, to justify any conclusion as to their cause.

• How It Operates—The experimental NBS profiler checks the voltage gain of three radio receiver stages while performance is simultaneously affected by wind or ground forces. Receiver stages which NBS called as "critical" were R.F. amplifier, first mixer, logic IF amplifier, second mixer, two stages of low IF, two crystal oscillator, and two frequency multipliers.

One class of these "critical" stages are used to connecting each tube and its associated components in a three-stage amplifier. A 2,000-cycle input signal was applied and the output voltage checked. Money concluded that stage-by-stage checks are necessary, because output checks alone would significant change in individual stages, he said.

NBS modified the receiver stages to make it possible the problem to be quickly corrected to the radio receiver, and to permit rapid step-by-step checks by simply positioning a selector switch. This involved "breaking" the grid and plate return leads, carrying them through a radio power component, and adding a radio power component and a connection and R.F. choke. The modification's cost of the original equipment was not reflected in the cost of the modified equipment.

• Easy To Use—NBS started its procedure to provide a direct "good, no good" indication to prevent its use by a semi-skilled operator without requiring the reading of a voltmeter and the notion of interpreting the results. By this means the range of the 2,000-cycle input signal is preset for each different selected switch positions to produce a single wave voltage from many previously functioning stages.

If the output voltage falls outside specification limits, a voltmeter-potentiometer circuit in the product triggers

a red warning light, giving positive indication of preceding failure in the stage under test. Without much added complexity, Money said, a stepping switch could be used or the selector switch to automatically check each stage in sequence, stopping whenever it observes a weak stage.

Noting that the principles used in the NBS device are not new and that the unit is used in experimental form, Money urged designers to investigate fault anticipation processes in their next experiments.

• Why Components Fail—A detailed analysis by Bell Telephone Labs of 202 components which had failed in selected Navy B-57B aircraft electronic equipment succeeded in pinpointing the basic causes of failure:

- 50% failed because of poor component quality (susceptible to component manufacturers).

- 24% failed because of previous failure of other components in the circuit.

- 23% failed because they are sufficiently rugged to withstand military and environmental (non-application) tests.

The cause of failure for 154 other components in the Bell study either can't be established as it still under study, G. C. Elmer of Bell Labs said. He explained that field engineers' reports on the equipment malfunctions incorporated the defective components and cited Bell materiality in its methods.

Elmer urged equipment manufacturers to apply lab analysis to component failure in order to develop basic corrective action. He also called for improved inspection and quality control procedures by component manufacturers.

• Mechanical vs. Electrical Failures—Don't overlook the importance of good mechanical design as your search for reliability, Victor Hess of Vitec Corp. of America warned his NPEC audience.

A recent study of Bell System electronic and video equipment showed that one chemical fault caused less than half the equipment failures but was responsible for 61% of the equipment "down time," Hess advised. "The basic lesson for electronic engineers is to call on the mechanical engineer for help."

• Sleepy Silicon—Cathode interelectrode insulation sometimes called "sleepy cathodes" because it builds up in volume when more rapidly doped usually too slowly can cause trouble in computers, radio and communication equipment. H. M. Wagner of the Street Corp. presented this warning. Many tube failures which previously were blamed on loss of tube emission and measure distance have more recently been traced to cathode surface insulators, Werner said.

Werner detailed a test procedure which will spot interface impediment to



How SPEED NUT Coil Form Fasteners

Transmit 3-way advantage to Weather-Reporting RADIOSONDE

...as told by PRIZE INSTRUMENT DIVISION
of Brundt Aviation Corp., Baltimore, Md.

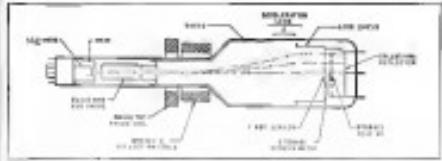
PRIZE engineers faced three basic requirements in specifying fasteners for the AN/AMT-68 Radiosonde. First, fasteners had to be light-weight, since the device is set free and carried to upper altitudes by balloons. Second, the equipment is unpredictable, making economy a prime factor. And third, because the Radiosonde transmits vital weather data back to the ground, its precise nature demands rigid, vibration-resistant fasteners for proper operation.

Therefore, Brass Nut-Coil Form fasteners were selected by Prize after checking many various attaching methods. They more than met the 3-point performance requirement, giving added savings in materials and handling over elaborate machined types.

No matter what your fastening problems, you can rely on a Tinnerman Fastening Analyst to lead the way to production savings. See your Tinnerman representative for details on this free service for your products. And, write today for your copy of SPEED NUT Savings Stories, a booklet of amazing savings to industry. TINNERMAN PRODUCTS INC., Dept. 13, Box 6868, Cleveland 1, Ohio. Distributors: Air Associates, Inc., Tuxedo, N.Y.



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Speed Nuts®
FASTER THING IN FASTENINGS



INTERFACED RAYTHEON cable tube can store indifference for as long as a week

Leadership demands constant achievement.



Air Attack! This plane could be needed if the U.S. is hit, then war will be imminent.

The U.S. Air Force is ready to answer any alarm—with squadrons of Lockheed Starfire interceptors[®] that can climb quickly to the strike, locate and knock out invading bombers in any weather, day or night.

But just like the alarm must be given. Somebody must spot the invaders.

And there are only two ways to spot an air attack: (1) By radar, with human eyes closed. Ground observation cannot always spot planes flying under 5,000 feet. So we badly need civilian observers.

Then, airplanes are being built to take sky-warning system off the ground. Far this job Lockheed is producing WV-2 Early Warning Controllers with 360-degree radar.

Also the Navy has many Lockheed P2V Neptunes on continuous patrol day and night. Their "eyes" guard against air attack too.

But we still need an additional 300,000 men and women observers to fill the leveled-soldier gaps. You give just a few hours a week. Call your Civilian Defense Office, or write to Ground Observer Corps, U.S. Air Force, Washington 25, D.C.

Aircraft are an important part of our air-defense system and, of course, are the backbone of defense against attack. These advanced Lockheed planes play a vital role.

The WV-2 Sager Controllers Early Warning Aircraft, developed for the Navy and the Air Force to extend radar range, is a whole new concept of mobile defense.

The P2V Neptune Navy Patrol Bomber, chosen by the Navy with an superb record of patrol and protection of U.S. coastal waters.

And the F-94C Starfire, the result of over 15 years' intensive research, which does the final job of closing in on the attack after speed, loosing the missiles, and shooting them down with more than human necessity.

When the U.S. has all necessary planes and personnel—civilian and military—it will be difficult for enemy aircraft to penetrate U.S. defenses.

GROUND OBSERVER CORPS NEEDS 300,000 VOLUNTEERS

Early this summer top U.S. Air Force officials with Civil Defense directors from 48 states and four territories, and reviewed in confidential detail the current efforts to defend America from surprise enemy attack.

"Despite a \$100,000,000 radar force around the nation's perimeter, gaps exist through which enemy aircraft could penetrate our defenses," declared the meeting was told.

That's why America needs a total of 300,000 civilian observers as members of the Ground Observer Corps. Nearly 200,000 have already volunteered.

The only practical means of filling the gaps in our defenses is through a 24-hour operation by civilian volunteers," the meeting was told.

Why can't America's radar network suffice?

Defense gaps exist because of radar's law of sight principle, and radar's failure to penetrate against clouds. Every time a radar beam hits a cloud behind which enemy aircraft could easily hide, radar's effectiveness is destroyed. Even so perfectly flat country the curvature of the earth shortens the effective range. Equally obviously radar is incapable of jumping.

These gaps cannot be filled by Air Force personnel due to the staggering expense. That's why they are needed in 27 perimeter states to run Ground Observer Corps stations 24 hours a day. Here is a critical patriotic job that requires just a few hours a week from each volunteer.

Aircraft are an important part of our air-defense system and, of course, are the backbone of defense against attack. These advanced Lockheed planes play a vital role.

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ADAPTER strip Spares have indicated storage capacity of positive flow.

In early stages, even in broad test, today's techniques use low amplitude test pulses and a few-duty cycle to measure the possibility of excessive vibration originating during the test.

• **Positive Flow**—Inherent in most designs and more so than those using heavier bodies—according to Ross Wood of Westinghouse Mfg. Co., Westinghouse designs hope with very liberal use of rugged housing.

• **Hinges**—toothed sheet and linkage, clinched.

• **Friction welds**—less structural resistance are involved.

• **Lever**—allowing operating temperature to rise.

• **Mechanical clearance**—between sleeve and gear is twice as great.

• **Higher**—inherent angular velocity of shock, shock to support.

• **Higher**—inherent angular velocity with resonance effects, other resonance interferences effects.

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Vibration Engineering that solves your problems

PROBLEM: To achieve a high degree of vibration isolation in high powered engines.

SOLUTION: No Potential Aircraft Resonance.



If the flexible mounting—the only vibration connection between engine and aircraft—then aircraft design and ground vibrations. Frequently designed to withstand temperatures of -65° to +200° and power levels of 1000 horsepower, these mounts eliminate resonance and harmonics.

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• **Mechanical**—Tension—1 per 100,000 force hours.

• **Electrical**—Parker (plunge) or strain—selected—1 per 70,000 hours.

Wood, angular velocity between the sleeve and gear, and the rate of acceleration to cause motor idle application and usage.

• **Sheet Metal**—Resilient—Metal

components are rated operating temperatures and loads which meet a

number of vibration requirements.

• **Structural**—Metal

and plastic materials required

are determined.

• **Electrical**—Metal

and plastic materials required

are determined.

• **Sheet Metal**—Resilient—Metal

components are rated operating

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• **Structural**—Metal

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• **Electrical**—Metal

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know how

KNOW HOW of Coleman engineering Co. goes back to the beginning of World War II. In those founding principles were well known and provenance necessities in the aircraft industry.



Today, in the field of specialized engineering and manufacture, Coleman engineers bring to you all the leading engineers and consultants in the field. Perhaps your engineering problem can find a answer in this company.

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**Thermo-Couples
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These Thermo-couple connectors are broken frequently and are exposed to moisture or are located outdoors, you can quickly replace thermocouples by extending wires and seal the connection again fast instead of installing thermocouples with quick coupling connectors—covered with non-expansive tubes. Illustrated is a Protected Thermocouple with plug and jack connector and moistureproof jacket.

Available in all standard thermo-elements.

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service life of 1,000 hours or more, if guided ribbons, and certain other apparatus, component life can be considerably shorter than 1,000 hours.

These components can be operated at much higher loads and temperatures, saving space and weight, it saves life insurance. But the big question is: How much can the rating be upped for short life?

A. P. Jernstok and W. T. Sadtler, Jr. of the Battelle Memorial Research Institute, described a new technique for obtaining short life ratings of components. They call it the "Short Step Method."

Preliminary tests on carbon film resistors indicate that the new method reduces the test and time required to establish short life ratings. Jernstok said. It also gives much sharper short-life resistance between individual components in a test batch that are compared with previous electrical, thermal, and

• Seal Automatic Lure-Magnet manipulation of loan resistor is eliminated except for initial station (hang) with a new small adapter developed by Sperry Gyro. This cuts the time needed to obtain a "pushup" fix. The job to be adapted is designed for use with the Sperry audio frequency (1500 kc) line receiver.

Chairman went to date claim that the new device operates securely in establishing a seal or update position by itself. He said there is no one, according to Roger Williams of Sperry who developed the paper.

Lure is a magnetic device which establishes a "line of position" based on the phase difference in radio pulses transmitted simultaneously from a pair of geographically displaced ground stations. If two pairs of ground stations are used, two distinct lines of position can be obtained, where intersection fixes a ship's or aircraft's position.

Allegation of the holding edges of the two radio gates, new performed mainly by automatically manipulating by a servodrive, the new Sperry device. If the continuous-indicator selector is used with two loan resistor, a navigator can obtain instantaneous position. This—an important point in high-speed aircraft.

• Better Attitude—Tells us that a better attitude can generally result in time-time differences within three microseconds, whereas the new adapter can do this in only one microsecond, under conditions of 2.5 milliampere static. E. J. Gruel and J. D. Uden most adverse E.I. signal-to-noise conditions, internal alignment brought out to five microseconds compared to only three microseconds for the new device.

Williams emphasized that even with the new adapter, the human operator must first acquire the station sigal

Are these 3 new to you?



It would pay you to know all about them

Don't let their modest appearance fool you; these are puzzle-busters and job-simplifiers extraordinary.

This is **TITEFLEX**—the Al-Metal Flexible Hose with 2001 industrial applications. It withstands temperatures, pressures, vacuums, vibration and the corrosive action of a host of liquids and gases. How can you use it? To connect moving parts of machinery. To connect machined parts. To absorb vibration, cushion impacts, dampen and cushion. To "transmit" maximum energy high-frequency currents. To shield wire and cables. And to handle difficult materials—from and end to another at sea water or steam.

Here's **LINERFLEX**, the new, flexible-sealed **Sleeveless Flexible Tube**. It's tough, corrosion-resistant, leak-proof. And its fibrous construction gives it greater flexibility, and longer life in applications too critical for ordinary corrugated tubing. Use it in your—if you've ever heard of hydraulic lines, oil barrels, refrigeration machines, air conditioning equipment, pump compressors, elevators or machine tools. For leaders, servers. Use these hoses have metal-to-metal seal. Seal is produced through spring washer effect of hose on fitting body.

TITELINE are the efficient means of absorbing liquid movement in many types of equipment. Their welded, corrugated-displugs construction lessens the risk of vibration loosening the hoses in which they are inserted and without reducing the flow rates of gases or liquids being conveyed. You can see **TITELINE** sleeves to seal high pressure valves and shafts, accommodate heat contraction and expansion of high-frequency vibrations, and to handle gases and common liquids under high temperature conditions. Special designs are available and complete believe assemblies can be furnished with any required type of fittings.

Get the facts without obligation

TITEFLEX literature contains full descriptions, technical data and requirements for use. **Linerflex**, **Displugs** and **Titeline** form a third knowledge-base of these products' behavior under existing service conditions. Check the products that interest you and mail the coupon today. We'll be glad to help you with any specific problem.

Let Our Family of Products Help Yours



Reduced wear, chock required. Neutral, inertial, automatic or flexible.



Helps the radically-sealed, flexible, and stretchy nature of Titeline.



Cross-section shows the welded, corrugated-displugs construction of Titeline sleeves.

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Castings

In Stainless
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**require Control
in Melting**



Art or induction melting at Lebanon Steel Founder's in a new casting process, for a basic mold duplicate precisely the material composition required. Electro welding is but one of many production processes rigidly followed by Lebanon engineers that result in CHICKE® castings of controlled high quality.

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 **LEBANON**
Steel and
Alloy Steel
Castings

to be sure he has looked on the ground score and not the surface. After initial signal acquisition, a very narrow scan path goes, so the adapter prevents the receiver from looking on the adjacent Williams cell.

► Improved Storage Tubes—Two types of versions of cathodes are storage tubes, ones described by engineers from Armstrong Mfg Co and Radia Corp of Canada. The first uses a body of metal wires for the cathode grid and an boron nitride cup where it can provide uniform positive brightness and a higher level of light emission.

If several stores of the radio stations are "stored" in the tube, no important

additional bit of information is made available. A moving target will then produce a 1-Mp², whose length is proportional to the target's relative speed. The storage feature also improves signal noise ratio, since the returning return of the signal makes it appear at much brighter intensity than earlier occurring "noise".

Two types of storage tubes were

► Storage storage tube at which a "series" and "parallel" function are alternately performed by a single electron beam as described by R. C. Higginbotham of Battelle. The improved version has a new "electron gun" which

focuses the beam so that it strikes the screen perpendicularly. Writing speed is about 15 microseconds per line, writing and reading time is about 10 microseconds per line.

Already in pilot production, the new tube can store information for periods up to one week without noticeable deterioration and can provide some "playbacks" without loss of stored information. Electronics and

► Twisted storage tubes, called the Gaggletron, has been redesigned to operate rightly between the writing gun and writing gun, cutting position noise to less than 1.25%, W. J. Drall of RCA said. The design was prepared principally by Drall, G. R. Padman and M. D. Marsh of RCA.

A newly added nuclear circuit has appeared the reduction of noise deterioration by reducing secondary electron effects, Drall said. The tube has a 201, signal-to-noise ratio and gives a maximum resolution of 400 lines. However, Drall said, the maximum writing speed is not sufficient to give grayscale (full time) reproduction.

► Colloidal Sulfide Transistor—Colloidal sulfide crystals have attractive number characteristics and show promise as "N-type" transistors. Gene Stern of Northwestern University said, his findings indicate that each crystal that contains a single polycrystalline sulfide particle will:

- Operate from 3.1 to 4.9 v, optimum injection voltage is about 7 v;
- Withstand twice the maximum rated voltage without permanent damage;
- Withstand twice the destructive voltage for 1 second without damage.

Stern said that colloidal sulfide transistors have been made which give good potential control, but no amplification. The difficulty of making contact to the crystal appears to be the cause, however, to a somewhat cumbersome polycrystalline sulfide transistor, Stern said. He also showed a series of infrared photographs.

► Nonlinear Servo—A two-harmonic servo system which uses a changeable damping ratio to improve its dynamic response was described by K. K. Bartsch of the University of Illinois. A low damping ratio is used at the start to permit rapid recovery. Once the error signal reaches zero for the first of several cycles an automatic switching device changes to a high damping ratio for critical damping.

Another multiple mode servo system which is linear for small error signals but which stretches on to operate at maximum error is a variable admittance for linear error signals was described in a paper by N. C. Rao and R. C. McHenry of Cook Research Laboratories. The admittance in the loop gives greater response than conventional linear systems.

► Mag-Amplifier Servo—"Main high

TESTING TOPICS



GREER PROPELLER GEAR MOTOR TEST STAND shows the mechanical EQ of the motor. Notice the placement of hydrodynamic bearing speed propellers. The stand will test double acting, single or double capacity and reversible generators.



GRIER III 10 MEGAHZ TEST STAND allows both static and low-speed aero-elastic, thermocouple, and noise test of Pratt & Whitney and Wright Aeronautical engines.

Testing the Flying Clippers

Pan American's Miami Overhead Base Line Green Test Equipment

Accuracy? Dependability? Speed?

These are the qualities Pan Am needs in test equipment, and finds in Greer. Greer has simplified and standardized its line in the past where customers can order test equipment right out of the Greer catalog.

Please feel free to call on Greer hydraulics any time you have a test equipment problem. If your operation is not within our range we will tell you when it can be answered. Call or write Greer today.

GREER
TEST EQUIPMENT



GRIER IIIA WAVEWRAFTER TEST is used for high frequency acoustic tests up to 1400 cps. Periodic of impact. Acoustic load 140 db. Resonant frequency 1000 cps.

Greer Hydraulics Inc., 434 Eighteenth St., Brooklyn 15, N. Y.
Telephones: 46 Commercial 8-1144, 434-7154. **Stock & Representatives** locally located.



The
Beaver
AERIAL SPRAY MODEL

240 U. S. gallon spray fluid capacity . . . 40-foot wide boom, giving a spray swath of 80 to 100 feet wide . . . Will cover 200 acres (1 gal. per acre) in one 20-minute flight . . . 2 hours fuel for spraying . . . 4 hours fuel for ferrying . . . A speed range of 60 to 110 mph. with safety and precision . . . Can operate from quarter-mile strip with full spray load . . . spray equipment readily removable—can be loaded in cabin for ferrying.

These Facts Speak for Themselves

We will gladly furnish more complete information.

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THE DE HAVILLAND AIRCRAFT OF CANADA, LTD.
POSTAL STATION E, TORONTO, ONTARIO

Remington Rand's M. N. Rand says:

**Modern Machines Need
Modern Moving...More and More
We're Using**

Flying Tigers



performance servo applications are now restricted to vacuum tube amplifiers since they utilize the advantages of magnetic amplifiers with no loss in performance. H. H. Woodhouse of the Naval Ordnance Lab in Long Beach, Calif., has developed magnetic amplifier bridge type converters.

Stabilized systems of full wave amplifiers for servo systems using conventional techniques is difficult, Woodhouse said, because the noise content of the system changes with gain. The basic mode converts to low-gain operation. The full-wave, bridge-type magnetron for linear ultra-low distortion power has overcome this half-cycle of supply frequency, and gain has an effect on line content. Woodhouse and Another advantage to the half-wave unit is its ability to accept either a.c. or d-c signals without a demodulator.

Woodhouse also developed a 400cycle 2-stage magnetron amplifier which was developed by the Naval Ordnance Lab. It is a 2-phase a-c motor with radio wave stabilization. The system has a natural frequency of 60 radians per second and a corresponding phase shift of 30 degrees. Woodhouse said.

► Stabilized Control Mount-The design of a roll pitch, yaw-roll, and yaw-rate stabilized aircraft control mount, used in analog computer analysis of the stabilizer servo system, was developed by P. J. Hendren of Goodyear Aircraft.

The control mount was designed to maintain the roll rate at 0.4 and 0.5 deg/sec, and yaw and roll rates velocities of 90 deg/sec, and maximum accelerations of 500 deg/sec². It is not known at present that the computer used to prove servo system stability during a time scale of 1 mill sec was Hendren's own CERA analog computer.

Missile Guidance System Outlined

An air-to-air navigation and guidance system which determines true longitudinal direction of motion, and distance traveled by a missile or aircraft without using radio aids, is described in a recently printed patent.

► Integrating Accelerometer-The patent sets forth a missile accelerometer which is guaranteed to enable it to measure acceleration (journal forces) resulting from airframe or missile motion in an eastward and north-south direction. Theoretical signals proportional to these several forces are independently integrated to give airframe or missile velocity in the eastward and north-south directions.

Another integration of the signal gives distance traveled along the path not morally perpendicular directions. The north-south, eastward velocity

signals could be visually displayed, the patient may, on motion or as a cathode ray tube to show groundspeed and direction of motion. The weight and center of gravity signals could be fed to a spherical gyroscopic computer to calculate present position based on the known starting position of the missile or aircraft. The device could also provide guidance signals to an autopilot.

► Preheat Problem-The patient doesn't go into the design of the double-integrating accelerometer. But unless the accelerometer is extremely sensitive and accurate, and the integrator's errors are small, a very large cumulative error could build up. The patient also does not discuss how the cost of the and much work computation would be reduced relative to the current vertical.

► Background-The patent, No. 3,163,072, was filed in June 1947 by Fred G. Harrel, Coronado, L. A., Calif., research engineer, and was granted on Oct. 7, 1952, following issuance of an Army Service service order.

From 1941-45, Harrel was chief of the radio direction finding research group in the Signal Corps Lab. Since that time he has been cognizant in charge of the radio engineering department of Servo Corp. of America.



Computer Solves 7th Order Equations

A low-cost electronic analog computer which can solve 7th order difference equations, partial derivatives, and more complex problems if memory equipment is used, has been announced by Beckman Instruments Inc.

Called FASE (Electronic Analog Sandpiper Equipment), the device can plus, multiplication, division, exponents which enable a purchaser to select elements and build computers to his individual needs. Additional information is available in Bulletin 254-67 from Beckman Instruments Inc., Scientific Products Div., South Pasadena,

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AVIATION SAFETY

CAB Accident Investigation Report on P-41 Puerto Rico Crash

Maintenance, Flying Technique Blamed

The ditching of a Pan American World Airways DC-4 near San Juan, Puerto Rico, on Apr. 11, 1952 with the loss of 51 lives is blamed by the Civil Aeronautics Board on poor maintenance by the carrier and questionable flying technique by the pilot. The carrier

and 12 passengers were saved. CAB's complete report.

THE ACCIDENT

A Pan American World Airways' aircraft, a Douglas DC-4, N 2310P, was flying at approximately 12,000 ft. on Apr. 11, 1952, about

11 miles northeast of San Juan, Puerto Rico, after taking off from the Isla Grande Airport. On board were five crew members and 41 passengers, including an infant. Both two passengers lost their lives in a ditching of the ditching, and the aircraft sank in water approximately 2,000 feet deep and could not be recovered.

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Typical Applications
DIRECTION PLATES
COWLING
ELECTRICAL PANELS
CABINETS
DUCTWORK

HISTORY OF THE FLIGHT

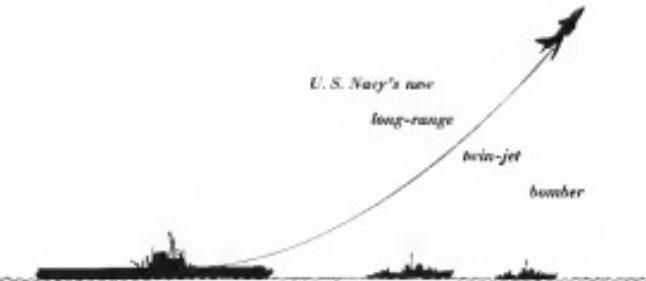
Pan American World Airways' Flight 525A originated from Honolulu, Hawaii, on Apr. 11, 1952, for New York City. The crew consisted of Captain J. C. Fern, First Officer W. T. Hollister, Second Officer R. E. Lathrop, Passen A. Flores, and Steward R. T. Taylor. According to company records, the aircraft had a total weight of 36,068 kg (79,750 lb.), which was within the allowable gross take-off weight of 31,213 kg (70,000 lb.). The load was properly distributed with respect to the required ratios of gravity loads to the aircraft.

From departure, the captain flew with an auto-pilot. Captain Fern, First Officer Lathrop, and the flight crew flew to New York International Airport, N. Y., to make a stopover of 500 feet, extending the flight time to eight hours and three minutes. This flight plan was approved.

The crew realized that the engine was trouble in the rear of the aircraft. They turned the aircraft around and the reverse power started. During the turn and the initial climb, the aircraft appeared to be sluggish but not in control to cause concern. At an altitude of approximately 250 feet with the gear up, the engines were stalled. Power was restored and the aircraft climbed at an indicated air speed of 105 miles per hour, the first officer noticed that the oil pressure of No. 3 engine was falling and that the oil temperature increasing. This condition was immediately passed on to the cockpit. The crew reported that the San Juan tower informed them that they were returning to the airport. Accordingly, at 11:11 the flight advised the tower of its intentions, and the tower replied, "Roger 525A, cleared to land. Recovery 9, wind east east right, obstacles two miles from the P.R. boundary, one mile." The company was alerted and upon request, emergency field equipment was started.

Because the oil pressure of No. 3 engine continued to drop rapidly and the oil temperature correspondingly increased, the propeller of this engine was feathered and power was increased to bring the oil pressure back to normal. At this time the aircraft altitude was approximately 310 feet. When power was reduced, the No. 4 engine hiccuped several times, however,

Oil lines referred to herein are American standard and used on the Atlantic route.



U. S. Navy's new

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twin-jet

bomber

the Douglas A3D

LOCK

Built for the Navy, and now undergoing tests, the center-based Douglas A3D is designed to add new striking power to the Naval air arm.

Performance data on this plane is still secret, but to experts of comparable size—aircraft or unclassified for

naval service introduction—will be able to carry an equivalent bomb load as high as or as fast as the Douglas A3D. Powered by twin jets, the plane is to be built in the long range class of the fighter; A3D will be in the 600 to 700 mph class ... yet its planned range, from aircraft

engines, will let it strike areas well beyond ranges of 500 miles at enemy targets.

Selection of Douglas to build the A3D is another example of this company's aviation leadership. Faster and faster was a longer period in the basic concept of Douglas' design.



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While our manufacturing divisions are engaged largely in defense pro-

mises. Following these hearings, the engine continued to run in a normal manner. A clearing turn was indicated to a westerly heading, and the captain said that his last climbing resolution he reduced the aircraft's air speed during the turn to 140 miles per hour. This reduction in air speed was accomplished by the captain using rudder deflection at an altitude of about 910 feet. No. 4 engine again became hot and ran rough. Standard pressure was reduced as this engine to approximately 13.75 inches, and again the engine ran smoothly. Subsequent attempts to operate No. 4 engine at normal power were unsuccessful due to inherent surge.

At 1217 the tower asked the flight to report its position and advised that engine "We are still quite a way out." And at 1218, the tower advised the San Joaquin County Traffic Control Center that San Jose that the flight was in trouble and gave its position as seven miles, 160 degrees from the tower.

The captain gradually reduced the air speed to 130 miles per hour, and at this time the standard pressure setting was changed slightly to the right to maintain an airspeed approximately parallel to the coast line. Because the aircraft was losing altitude, engines Nos. 1 and Nos. 2 were increased to takeoff power. The second officer was sent to the passenger cabin to advise the passengers and crew that fuel was to be conserved, and all fuel drain valves were then opened. After the second officer returned to the cockpit, the flight advised the tower at 1219, that it might have to ditch and the captain instructed the second officer to alert the passengers. The second officer returned to the cockpit, advised that a ditching was imminent, took a forward seat on the ejection seat harness, and left the aircraft.

At 1220, an Air Force C-54 flying in the vicinity advised the San Joaquin tower that a DC-4 aircraft was descending rapidly and was advised to evade the flight. This flight 524 continued to strike, and the throttles of engines Nos. 1 and 2 were advanced to takeoff stops. With the air speed near 130 miles per hour the flaps were lowered to the greatest extent when the landing gear was withdrawn. The landing gear was held down until the aircraft was about 100 feet above ground, and the landing gear was closed. The second officer obtained a life raft which he carried in the main cabin and launched through a forward emergency exit on the right side. The first officer also obtained a life raft and joined the other two exits, placed himself the aircraft through a cockpit window. The captain entered the cabin and assisted passengers in evacuating the aircraft through the main cabin door until he was except overhauled by the officer on the sea opposite the door. The aircraft sank rapidly those minutes after leaving on the water.

At the time of the accident the weather was high broken clouds at 10,000 feet with lower scattered clouds at 3,000 feet, visibility 10 miles and wind from east-southeast, 15 miles per hour.

INVESTIGATION

From a large deck which was observed on the water following the sinking of the aircraft, it was determined that the aircraft沉没 at latitude 35° 52' north and longitude 08° 15' west. This is approxi-



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nearly four and one half miles off the north
coast of Puerto Rico and 11 miles from the airport.

Captain Burns said that when the "pre-takeoff" check was accomplished all engines operated normally but that during the taxi to the runway, the right engine began to smoke. However, the engine instruments indicated that they were delivering normal power with all pressures, temperatures, and fuel flow gauge reading a normal operation. According to the captain's testimony, from the time No. 3 propeller was lowered until about 10 seconds later, he noted attempting to extend it because it was freezing the retract or a nose-up attitude, in an effort to maintain altitude, and as speed and altitude were diminishing throughout the entire period. He stated that because the aircraft was unable to take off, he changed his original intentions where he towed the aircraft to avoid a possible forced landing in a congested area or on a road roof.

He stated that an appreciable variation of the aircraft was noticed when the No. 3 propeller was lowered, and that the aircraft would not respond to control commands, difficulty in maintaining directional control. Throughout the latter portion of the flight, the left aileron had the check lock in board, and both he and the co-pilot checked all the instruments and controls as the cockpit settling down, and the aircraft was flying on an upward climb. This check also showed all outside instruments properly and engine instruments indicating normal operation for the conditions involved. The captain said, however, that immediately prior to ditching, the fuel tank of the No. 1 and 2 tanks became full as he was approaching port two minutes after the fuel quantity valves were opened, the landing was made. The crew and the landing was made full low and was not considered sufficiently rough to damage the aircraft; however, prior to landing, his right hand became locked out of his seatbelts and the mouthpiece and oxygen feature on the water. It was later found that the tail section had broken off behind a bulge in the rear of the cabin door. Although Harry was running at the rear of the aircraft, some of the seats were still attached to the front.

These 20 main seats and one 10-man raft were carried on board the aircraft as a part of the Missionary gear. These were stored in an open rack to the rear of the pilot's compartment. In addition to the life raft, there were 100 feet of line used for safety purposes. These packets were located in a pocket on the back of each seat. Above each packet was a sign in both Spanish and English describing the location of the packets.

According to the testimony of the pilot and co-pilot, they were aware of the state of the aircraft when the second officer returned to the main cabin the second time and by a downward motion of his hands indicated the aircraft was about to be ditched. Although they did not hear this crew member say anything, they understood that ditching was imminent. The aircraft had been ditched, and damaged their life preserver. After the aircraft contacted the water, they thought to the passengers that the life preserver was located in the bags of the seats and then proceeded forward.

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U.S. PATENTS 2,647,493 AND 2,842,474

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opened the two emergency exits on the left side of the cabin, shielded out on the wing and rotated passengers through these exits. The passengers were not yet held until the pilot was able to land, however, so he had to fly the plane another hour prior to ditching. As a result, considerable confusion occurred.

The second officer was able to locate a 20-mm self-launching gun mount in the pilot's compartment and carry it to the rear where he used it to shoot down the emergency exit on the right side of the aircraft, through which he was depicted. The first officer and a woman passenger tried to locate water, but were unsuccessful, and because of the rapidly rising water was forced to abandon the plane. They were rescued by a nearby boat.

Immediately following the ditching the captain went into the cabin and ordered the passengers to shutdown ship. Interruption static was very little response. He then called a passenger to open the main cabin door, and began to hear rattling passengers through the door. The door was closed, and the captain propped the handle as if about to open it again, but as he did so a wave caught the door rather than pushing it outward, causing him into the water. Due to the heavy surf, he was unable to return to the airplane.

At 10:12 passengers who survived, reentered the aircraft through emergency cabin exits, first through the main cabin door, and out through the right cockpit window. The first and second officers located the only life raft launched and took charge of its removal. The third officer located the life raft and took charge of its removal from the aircraft. The captain and seven other passengers were picked up by rescue boats after floating in the water for 30 minutes to hours.

When the U. S. Coast Guard Rescue Coordinator Captain Clegg was advised that the crew had been picked up, he directed the search for survivors. A Coast Guard PBY helicopter shortly was selected to prepare for rescue operations, and a few minutes later was dispatched to the scene. The U. S. Coast Guard cutter "Bremerton," together with a Navy tug, and other naval vessels were enroute to the scene. All survivors were picked up by rescue boats and were brought to the U.S. Coast Guard cutter "Bremerton" at approximately 10:45 hours. An additional PBY aircraft was selected to assist in the search for survivors. The second officer immediately located the last survivor and informed the people on the last aircraft that he was one of the last to leave. After 21 hours of floating in the water, he passed this information on to the next rescuer that another survivor had.

The new crew on No. 3 engine for approximately one minute and because of the unusual noise in the nose section thought the engine was dead. The engine was started, and additional metal fibers were found in the lower part of the nose section housing. Metal fibers were stripped to remove and check the same plug and oil screen. At a check of this inspection, metal fibers were found in the oil screen and the oil tank. The driver then checked the oil tank and found the driver and cleaned the oil tank and filter. Examination of the housing revealed the presence of approximately a thousand of metal fibers. These fibers were tested by use of a magnified snow storm and sulphuric acid, and in the opinion of the mechanics who made these tests, the fibers were of the same material as the fiber glass. In order to determine the exact position of the metal fibers, it was not in accordance with the procedures outlined in the consumer's Maintenance Manual. The normal procedure is the rotation of certain metals 90° to 180° and the only similarity in these rotation when asphaltic resin is used is when the metal is aluminum. The

air completely dried. The aircraft was returned to the hangar for complete service, after which the engine was removed.

During the run up, no unusual engine noises were heard, and the oil pressure, fuel pressure, and fuel flow, etc., were within operating limits. During the takeoff and climb the aircraft appeared to be normally as every previous flight with no engine difficulties. After being in engine reverse for 100 hours and 35 minutes, No. 3 engine began running roughly. A short time later the engine failed, and its propeller was feathered. Considerable difficulty was experienced in lowering the propeller due to the roughness. After the pilot stated that the indicated fuel flow for the three operating engines was below what he expected and he refueled this was done on the aircraft's Maintenance Log.

An American Weld Alloys employee checked conditions several minutes after the accident and recommended to perform all necessary maintenance at San Juan. In the event it is necessary to increase in storage in engine at this base, it is done upon arrival from Miami.

Upon the arrival of Flight 327 at San Juan on Apr. 18, 1958, the engine was taken off the aircraft, cleaned for storage, and the right magnetos on No. 3 engine were replaced. The last four propellers were checked, and a comparison between the No. 4 engine and the No. 3 and 2 propellers showed that No. 4 was experiencing 20% power loss. No. 3 propeller was repaired by the manufacturer. The No. 3 engine cut loose and never was checked. Small metal fibers were found on the screen, and a similar fiber was found on the propeller. These metal fibers were tested by using a magnetized screw driver and were believed to be aluminum. This was the reason for the metal fibers found in the engine. The metal fibers had a staining color which appeared to come from the nose section. The second officer immediately checked the last and said that metal had been removed before he feathered the propeller on the last flight. After 21 hours of floating in the water, he passed this information on to the next rescuer that another survivor had.

The new crew on No. 3 engine for approximately one minute and because of the unusual noise in the nose section thought the engine was dead. The engine was started, and additional metal fibers were found in the lower part of the nose section housing. Metal fibers were stripped to remove and check the same plug and oil screen. At a check of this inspection, metal fibers were found in the oil screen and the oil tank. The driver then checked the oil tank and found the driver and cleaned the oil tank and filter. Examination of the housing revealed the presence of approximately a thousand of metal fibers. These fibers were tested by use of a magnified snow storm and sulphuric acid, and in the opinion of the mechanics who made these tests, the fibers were of the same material as the fiber glass. In order to determine the exact position of the metal fibers, it was not in accordance with the procedures outlined in the consumer's Maintenance Manual. The normal procedure is the rotation of certain metals 90° to 180° and the only similarity in these rotation when asphaltic resin is used is when the metal is aluminum. The



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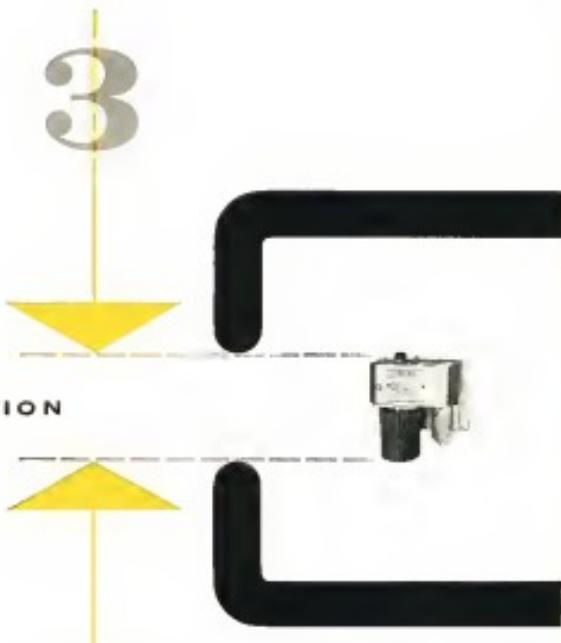
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3

IGNITION



It's no great trick to fire up an aircraft combustion heater from ground level and to use a quick start every time. At high altitude, however, the spark must be "hot" enough to overcome ice particles, frost, and dirt accumulation at spots of corrosion.

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one engine shaft was not disassembled, however, it was given a cursory examination and a mechanic stated that a bearing was damaged. After lifting of metal was found in the bottom of the main section. A mechanic placed his finger through the opening and found that the bearing was gone and found metal flakes were near the green. These findings were called to the attention of the mechanical chief mechanics.

The short cockpit was not on duty when the work was done; however, had the assistant chief mechanic been present and not of sufficient experience, the claim might have been contested, since he was subject to call all the time. The assistant chief mechanic did not consider this cause of action necessary and unwilling to complicate the policy note the following message to the company's Master Office:

"OMAHA AIRPORT COWSH N1899
#7 ENDING FIGHTER STAGE 4
DUE ROUGH NIGHT MAGNETO
SHOT SAND-ROUND ALUMINUM
SPOT WIRE CUTTING CHANGING
FLUSH ENGINE CHANGED OUT
CHANGED RIGHT MAG STOP
ON R/W FOUND SPOT BAD NIRE
ON NOSE SECTION STOP FRIED
COLDING CHANGING NOSE SEC
TION STOP WIRING AFTER R/W
MAGNETIC 18999"

In effect, the message means that he was changing the right magnetos, that he had found shorted aluminum wires in the nose and tail sections and that he was changing the engine and changing the oil, also because it is winter. The nose section was being checked. Whether he can acknowledge receipt of this message or not may not matter. According to the testimony of the mechanics, since working was local from Miami, he considered the job had been completed to his satisfaction.

The committee, Milwaukee, Missouri specifically states that when foreign aircraft, such as Americans, is found in the service, the following actions of procedure is to be followed: "The airline oil system is checked at tank, oil selector, oil temperature regulation and oil pump, until the thoroughly cleaned oil is obtained to operate satisfactorily the necessary engine system. Put about 45 gallons of oil in the tank and can the engine for about one-half hour, bringing it up to take-off power over the two airports only during the period. Drain off about the same amount of oil and add more cleaner oil. Run up engine again, put tank pressure back on engine again, and check pressure between the oil pump and vacuum pump on the necessary cylinder. If all right, then go to flight."

When the nose section was changed, the three pressure tanks were not cleaned, so the cleaned engine ran up with only 45 gallons of oil in the tank was created. The purpose of this run up with but 45 gallons of oil is to accomplish a more efficient flushing of the engine's oil passages, thereby depositing any residual metal flakes as far as possible or on the oil pump assembly and motor. By running this just after the principal procedure, the additional cleaning was not made, and a necessary additional hour of engine run-up time was lost. In fact, oil was placed in the tank to the



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**Headquarters for
VIBRATION CONTROL**

fall level, and the engine was then run up to a full power rating to test its function. The oil temperature and water were then checked, and since no failure of metal was found, the engine was released for service.

Subsequent to the accident, the nose section had been removed from the aircraft and sent to the Board's investigation, and certain parts were removed and forwarded to the Washington office for further examination and study. The examination revealed that the rotors did not fail, but partially failed. Failure of the housing allowed the engine to move forward and out of the aircraft. Continued operation in this condition would eventually result in complete failure of the vibration gear assembly.

The two stage caps from the No. 3 engine propeller vibration gear were sent over to the laboratory, where the results of these caps were given a spectrographic examination at the U.S. Bureau of Standards. This examination showed that metal particles were concentrated in the upper 1/2-inch layer of the shims, and when these same particles were repeated it was found that the metal particles were also present. The major constituents were copper, molybdenum, chromium, manganese, nickel and lead. With the exception of the lead, which is an anti-knock agent in the fuel, all constituents were found in the vibration gear and in the engine. The remaining parts of the shims below the 1/2-inch layer had lead in its major metallic constituents.

As the aircraft was departing the ramp, the leg was placed aboard, which was the last time the vibration gear was attached to the aircraft. At the time of the impact of No. 3 engine, the leg had retracted; however, none of the crew checked the leg before flight.

The Latin American Division of Pan American World Airways maintains a flight and ground training school in Miami, Fla. All flight crews are taught by experienced instructors. This is the primary source there for extra attention to pilot instruction and do not by the book.

Captain Basso was employed by Pan American World Airways as a co-pilot Sept. 1, 1952, and as chief pilot on company DC-4 flights. On Jan. 27, 1952, in the fall of 1952, he was named as the Bellbird trustee and received special hours' training in a Boeing 717 aircraft, following which he served as a co-pilot on this type aircraft for a period of approximately one year. In January of 1952 Captain Basso completed his first solo training and 12 hours of flight training on DC-4 equipment. This was given at Dominicana Training Center assigned to captain.

On Jan. 9, 1952, upon completion of his trustee training, Captain Basso was recommended by his instructor to become a flight test and flight test director on DC-4 aircraft. As a result, on this date Captain Basso was given both his commanding and a flight test in the Chief Flight Instructor, who, feeling he needed additional time, flew with him on the two following days, after which he was given the necessary ratings. Captain Basso has flown approximately 200 hours in pilot as commander on DC-4 equipment prior to the accident.

A review of the aircraft's records indicated



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that prior to departing this flight, the engines had the following total time since last overhauled: Nos. 1, 2, 3, 4 and 5, 1250-14, and No. 6 engine, 1110-14 hours. In the same Log, "flight entries" were recorded comment which indicated that the aircraft was flying as planned. In each instance the aircraft was below the allowable gross weight. Other comments reflected that few birds were seen and no significant damage was noted. The log, under "Accidents and Service," indicated that the last flight item were "continued to Miami."

ANALYSIS

Only a minor take correction for you was required from the time the propeller was installed on No. 3 engine until the accident occurred. This was due to the fact that during certain portions of the flight takeoff and maximum power were used on Engines Nos. 1 and 2. During these power settings, No. 4 engine was set at 12.5% inches of mercury. From this it may be seen that the No. 4 engine was performing considerably above its rated power. When No. 4 had been at a decided running instant when power was increased on engines Nos. 1 and 2. It has been established by flight tests that the DC-4 aircraft loaded as a 100% passenger will maintain level flight and climb slowly, with only two engines operating at a maximum constant power and with the propeller at the recommended rpm setting. Therefore, the aircraft, under the conditions described, should have at least one hundred additional minutes.

Referring to the Performance Chart in DC-4 CAA Approved Flight Manual, it is apparent that the aircraft will experience zero transition to the condition immediately preceding this accident, and with two engines operating at maximum continuous power, propellers of the remaining four engines held fixed, the aircraft will climb at the rate of approximately 15 feet per second. Also, it can be seen that with two engines operating at maximum continuous power and the fourth engine partially feathered, the aircraft will climb at approximately 400 feet per minute.

Engines which have considerable time as service time will a lot in power. All of the engines involved had approximately 1,200 hours of service time and although the engines were not equipped with torque switches, it was impossible to determine exactly what class wind power instant that this flight. However, even assuming that there was a loss of power due to flow or control system failure, and that the remaining power of the three engines operating as stated could be less than that from two good engines operating at maximum continuous power.

Throughout the flight and the subsequent climb, the engines would follow the expected procedures outlined in the aircraft's Operation and Flight Manual. It is said that, after departing the No. 3 propeller, he established an altitude of 145 miles per hour throughout the climb but after experiencing difficulty with No. 4 engine he then established an altitude of 135 miles per hour as an effort to climb at the maximum rate. Although the company's Flight Manual states that these air speeds are correct for Douglas and Douglas' operation, respectively, this applies to an

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craft equipped with Soviet hydrogen, or perhaps that built on the floorboards. The name of the critics was "Engen Rikord," and "Engen Ulrich Wiles Rikord." Should no engine fail after power has been reduced to idle power or at one hour after takeoff, all power on good engines is "rated power" or "ideal" according. After power has been reduced, a normal fueling procedure should be completed?

Captain Bilek said that after he had established control of his engine per hour, the aircraft continued to lose altitude, and that the two good engines were not in control to take off power until he decided to land back. Since he considered that the fuel load was correct, he was convinced that the fuel system was not at fault. Apparently two engines plus the load factor on the water it can be seen that a considerable period of time was consumed in attempting to climb at rated power. In an emergency such as this, where the maximum altitude was only 900 feet above sea level, a good flying technique would not prevent a loss of control in maintaining a continuous nose high attitude. This could well have caused the difference between maintaining flight and losing altitude.

The investigators were not advised in sufficient time that the aircraft was to be ditched for them to adequately prepare the power plant for water impact. When the officer in charge came to the cabin, he told the crewmen to close all checklist entries to prevent a possible fire at ditching. This was done, and, according to the power plant and the steward, they closed the checklist section in which they did not consider there to be a ditching checklist. When the second officer went returned to the cabin, they did not see him from above when they were seated, but from his actions they knew the aircraft was to be ditched. The second officer told the steward to open the door and attempt to open the passengers' doors. Additional time might have been used if previous instructions had been given the passengers in the location and use of the pilothole.

The company policy of running 100% rated is a major component to the use of the plane does not prevent ready emergency ditching. However, the aircraft is not able to do so in the case, and because of the close quarters in the cabin of the aircraft, they cannot be readily launched. In this instance, only one exit could be opened freely, the rear exit in a second exit position, when an emergency mode to switch off. It was this exit that had been readily available, although very slight head room.

The conclusion at San Juan also performed the mission on the No. 3 engine and changed this engine's nose section cold that all wear due to them was performed at around 100 hours of flight time. When the aircraft landed, the aircraft had sustained, however, did not consider it necessary to change the engine, although a large quantity of metal debris was found in the oil sump, etc. They did not necessarily know that these pieces had traveled through the engine, and if they had, they did not know what part or parts of the engine had failed. To determine the extent of this failure, the engine should have been further disassembled. She was not done. Instead a nose section was installed despite considerable evidence of metal particles in the old nose section

Research Rides a Rocket

The Naval Research Laboratory's Viking rocket research at White Sands Proving Grounds, N. M., shows facts, figures and formulas in the upper atmosphere.

Humanity far into the blue, Naval Research Laboratory rocket scientists of the earth's upper atmosphere... that basic the answers needed to guide the designs of tomorrow's piloted and piloted space-vehicle system for peace or war. What are the pressure and temperatures of the earth's atmospheric layers... the high-altitude changes in the earth's magnetic field affecting navigational instruments... the alterations in radio waves caused by the ionosphere... the effects of sun spots on communications equipment far beyond the blinding orbits of the earth's heavy atmosphere!

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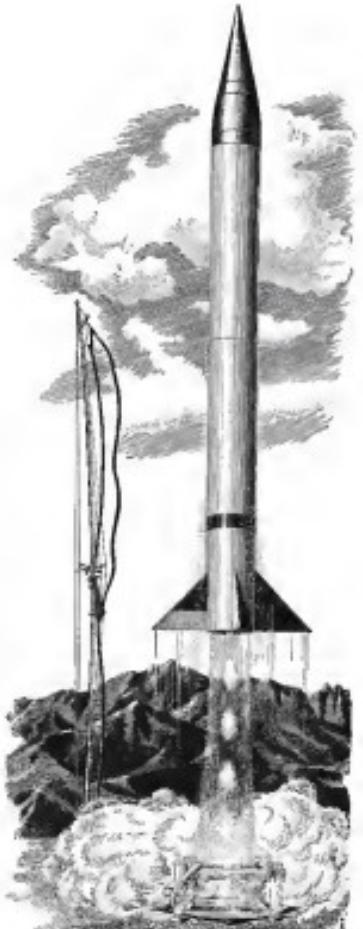
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sell the lower front of the power section of the engine. A dispatch describing the when being taken was then sent to the company's New York office. Upon receiving, received the information did I have the memo from to San Juan that this engine had stopped. Due to the condition of the No. 3 engine, the aircraft was "hot" according to the memo.

The information contained in the original report from the engine's supplier indicated greater definitely cleaved particles of metal after than otherwise. The top cleavage of edge was predominantly oval and worn, whereas the major portion consisted of short, irregular, jagged pieces. The rate of deposit of material can be expected to increase as the event of a progressive failure in the engine. Therefore the other end deposit in the top is lack of edge indicated that a progressive failure was indicated. The above reasoning is in accord with the observations made on the post failure inspection and damage.

The evidence indicates that the maintenance operations of this center at San Juan were not conducted in accordance with the high standards required for air line maintenance.

As a result of this and similar incidents the Board has proposed amendments to Parts 65, 41, 47 and 61 of the Civil Air Regulations with addition to managages and maintenance equipment and procedures to minimize damage due to failure to the occupants of aircraft from early to the time it has been found that accidents have occurred when there was insufficient time to adequately plan and prepare for a ditching. Among others, the following amendment to the Board's regulations have been proposed:

7. All repaired seats and late seat shell be repaired, shall be adequately equipped for the route to be flown, and shall be installed in approved locations. They shall be easily removable and easily accessible to the crew for preparation in the event of an unanticipated ditching.

7. In the case of extended emergency operations such as cross country established procedures for rapidly bringing passengers to the location and method of operation of the aircraft to be ditched and the location of the site. Include landing point and a demonstration of the method of dousing a life jacket. Such landing point shall be accomplished prior to arrival on an extended emergency flight when the aircraft presents itself with no other choice. On flights not proceeding directly over water, the landing point shall be accomplished some time prior to reaching the emergency portion of the flight.

The Board is continuing studies of problems relating to ditching and rescue lines.

FINDINGS

On the basis of all available evidence the Board finds that:

1. The engine, the aircraft and the crew was properly certificated.
2. Weather was not a factor in this accident.

3. The company's maintenance department at San Juan should have been alerted to a dangerous condition when used parts were found in the nose section of No. 3 engine.

4. For American's Mocon offer, having received information regarding the No. 3 engine from the maintenance department at San Juan, the company gave oral instructions to San Juan that this engine be stopped. Due to the condition of the No. 3 engine, the aircraft was "hot" according to the memo.

5. No. 3 engine failed immediately after which was followed by a partial loss of power of No. 2 engine.

6. The engine demonstrated questionable flying technique under the existing circumstances.

In the Civil Aviation Board:

Donald W. Nepp
David Felt
Jack Lee
Joseph P. Adams
Elton Gossney

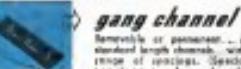
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AIR TRANSPORT

Five-Fold Air Cargo Gain Seen by 1959

- Lockheed study coincides with Douglas conclusions.
- Findings based on past trends, new equipment.

By Lee Moree

Air cargo volume will increase five-fold by 1959 and surpass passenger volume. It will give the airlines 37% of their total revenue, compared with today's 4% (including mail traffic). So says a new Lockheed Aircraft Co. market forecast which is called "Air Cargo Trends."

The forecast reaches the same conclusions as a similar study by Douglas Aircraft Co. early this summer (AVW, June 16, p. 57), although the forecasting methods used are different.

Other findings of the Lockheed report, released today after 18 months research by Lockheed cargo engineers L. R. Blackney and Charles J. Kornich, + Biggest profit potential per dollar of investment than passenger business. The cargo plane can earn 55% of its cost in one year, compared to 45% for a passenger plane. Lockheed imports Reasons: higher load factor, less passenger aircraft utilization required.

+ 25 billion tons/miles a year by 1960—a volume equal to dispatch of about 50,000 railroad freight cars across the U.S. per day for a year.

+ New 1049A and DC-6As are the key to making good on this potential, Lockheed says. A fleet of ten Douglas DC-6As and ten Lockheed 1049As could carry 334,160,000 ton-miles a year, which would be 10 times the current total ton-mile load for Lockheed's airfreight. The Super Constellation's capacity is 45% greater than its modern Douglas equivalent, the DC-6A, Lockheed claims.

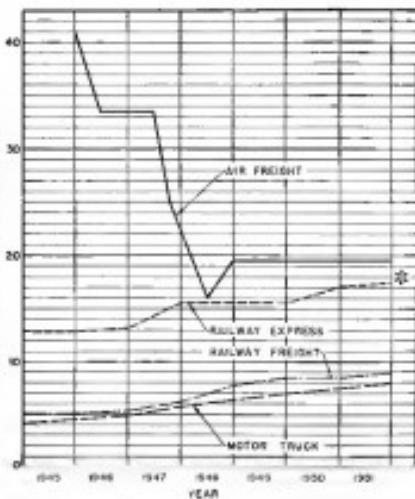
+ Growth trend in the market will speed up later in the decade as airfares readjust, flight and payload costs continue, replacing old planes with 1049s and DC-6As (Chart 2).

+ Regardless of rate trend, the airfreight market will expand about as predicted, Lockheed says. One reason is that it is not the size or scope that counts, but the relation to the rising cost of competitive surface transport (Chart 3). Air freight grows automatically by the industry trend to tighter inventory

Lockheed Comparison of Cargo Plane Capacities

	Payload (lb.)	Block Speed (mph.)	Ton Miles (lb.-mi. day)
Curtiss C-46	12,160	300	3,000
Douglas DC-4	18,000	300	14,800
Douglas DC-6A	25,460	305	32,176
Lockheed 1049	36,380	305	47,000

Source: "Air Cargo Trends" study by Lockheed Aircraft Co.



* NEW ARRANGEMENT OF AIR/FREIGHT
NOT REFLECTED IN RATE

CHART 1. Rate comparisons, direct truck for 100-lb. shipment, Bureau/N.Y., N.Y.

control, quicker delivery, and customer acceptance as a means to cut down material shortages, cutting requirements, damage to equipment and effort of plant shutdowns.

+ An express and mail will increase in

a steady trend. Express and mail, together with freight, make up the overall "cargo" category.

+ Although warehouse prediction by Lockheed "will depend to a large extent on the plan of action followed by the

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to upright position without pressing the "recline button."

Forward and rear seat backs are large diameter 605T three-tube. The side door structure is a welded assembly of one-inch 605T tubing riveted to the forward and rear tandem transverse beams.

The outward structure is designed to conform to the contours of the airplane. The semi-welded closed box structure of 605T alloy sheet, rear positive fore-aft fitment of the seat to the side of the fracture. Seat structure is divided into halves by a tubular spacer bar also of 605T material.

It stabilizes the forward and aft

beams and provides stability for the center seat rest.

Cushions for seat back and seat are of polyesterized hair or leather. Vallet or Sun-beltmen cushions are supported by light-weight nylon cords held tightly in place with metal hardware. The absence of the arched cloth and of the cushion makes additional space available.

Seat backs are of simple design having positive fore-aft locking position for the reclining backs.

Four attachment points are provided for the new 340 seat, two on the side of

the fracture and two on the front of the side rails. Either bolt-type or quick-release studs may be specified by the purchaser.

►**Couch Analysis.** The Northwest Airlines crash at a Convair 240 in Phoenix, Ariz., on 12 October 1958, typified the early days of the passenger analysis of properly designed seat backs equipped with the modern safety belt mechanism designed to withstand 3,000 lb static load combined with the inevitable consequences of a strong, pressurized transport landing.

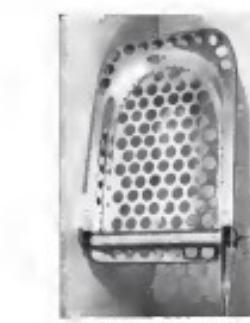
Analysis showed that the airplane ditched in 15 ft. of water during maximum stability conditions while making a normal rate of descent of about 500 ft per sec. The right wheel touched the water first, causing the airplane to roll to the right. Then the nose gear, left main wheel and right main wheel impacted one of the landing gear, left wing and left engine nacelle. Right wing suffered bad damage and sheared off the ball.

►**No Passengers Killed.** All 31 passengers and crew of those except exhaust air with injuries reported as severe, with these exceptions. One had a fractured hand, another a contusion of the spine and the third a slight injury to the kidney attributed to the twisted position in which the passenger was sitting when the plane hit. Pilot and copilot reportedly struck their heads against the glove shelf in the cockpit during extreme impact. The evidence of the "injury" was further off in the cabin, was unreported.

Advantage of his special Convair seat back design is exhibited by the fact that backs of six seats were struck hard enough to cause permanent deformation of the structure, presumably by the heads of passengers hitting the headrests. It is probable that other seat backs used in metallic carbons for other passengers' heads without causing plastic deformation of structure could have failed.

►**G-loads.** Estimates are that the full and wings absorbed peak loads in the range of 10 to 15 G in the report. Cessna Research engineer A. Howard Johnson studied the crash wreckage, and the photograph he took indicated that seat and seatbackfractured and may have caused prescribed CAA design load requirements of 6G forward, 6.6G downward, and 1.9G sideways. Failure of some seat structures indicates that these loads were exceeded, although the mean force of deceleration from first impact until the plane stopped did not exceed 2 to 3 G.

Approximately 65% of the seats in the forward cabin area had failures of anchorage. Only one-third of the car-



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SEAT BACKS GAVE but not held

seats broke their anchorage at the center and all were analyzed. Analysis attributes the failure to the location far from the bottom of the frame particularly due to tearing off the nosewheel. These seats were constructed with only slight modifications through the strong center seatline structure to the solas center-

the new Convair 340 seat, a development of the 240 seat designed by G. E. Sherman. Convair safety design engineers, the best in world, designed both the 9G, forward, 6.6G downward, 1.9G sideways, and 3G side-load, and is considered by Convair as one of the most advanced seat structures now in use.

►**Futura Tandem.** Study of the Northwest 240 early indicates a future design trend to even smaller aircraft than the 340 seat. The trend is expected to be left in smaller executive and business aircraft as well. One new long-haul design, Paul Otto Kappens' Helicopter, being developed with seats which will take 75G loads down and up.

Expectations are that the modern pressurized transport will be capable of taking much impact loads because of the neighborhood of 10G's, with relatively slight damage. If this is true, designers of interior cabin structures are not getting full advantage of their basic strength when they design seats which would fail at perhaps one-third of the load that the hull will take.

Hinchey and Hugh De Haven, director of Crash Injury Research, think that the new pharmaceutical safety record of the Northwest 240 crash of New York virtually can be measured in a large percentage of air transport fatalities. Some of the blame is at the airline operating board in a few well-defined design parasite.

►**Design seat backs of durable metal structure that will cushion the shock of head or body impact without serious injury.**

►**Design seat backs to fold forward to provide further "give" at initial impact.**

►**Airline seats firmly to primary structure of the airplane; no passengers will "fly out" under relatively high G forces.**

►**Anchor passengers firmly to their seats with roughly tightened 1,800 lb load and bolts now required by Civil Air Regulations.**

Braniff Asks Higher Domestic Mail Rate

Braniff Airways has asked Civil Aeronautics Board to set a higher temporary domestic mail rate than the \$5.50 cents a ton-mile proposed by CAA. Braniff gives as its reason the new McConaughay, which will still add 10 percent to the rate. The Board agreed that Braniff's rates should make the mail service available to get along on the approximately 55-cent rate.

Since the rate is only temporary, CAA has plenty of time to consider Braniff's plea. Post Office department descended a full hearing on the Braniff's

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REPLICATES AND MANUFACTURES
OF THERMAL SWITCHES

original proposal of a permanent \$3-per-unit rate for BAAU. Post Office, skeptical of BAAU's ability to make good on that rate, asked CAB to acquire the air line to set up an "equilibrium reserve" of 10% of traffic. CAB agreed to a permanent rate as low as \$3 per unit to BAAU. This older line had CAB to propose the temporary rate as the interim while the "equilibrium reserve" is debated.

Nonskied Licensed

Canadian Air Transport Board has licensed Rochester Aeronautical Corp. to fly nonskied charter services from within 50 miles of its Rochester, N.Y., base to any point in Ontario, Canada's Atlantic Coast provinces and Newfoundland, south of 52 deg. latitude. The owner is restricted to using planes having a maximum load not exceeding 5,000 lb. The service may not deliver traffic between Canadian points.

SHORTLINES

► **Air France** will get 16 new planes next year, including Super Constellation, Viscount, Viscount, the French Bazaar, and Breguet jet Concorde.

► **Air Transport Asia**, based Dec. 9, whether to adopt a monthly sample survey of traffic origins and destinations, now proven practical by ATA itself. The data used to be collected was annually and published two years later.

► **American Airlines** air freight volume topped \$1 billion in October with more than 6 million tons and raised its industry record twice which AA says it hopes to surpass again in December.

► **Australia National Airways** will get a government loan to buy second-hand planes in striking areas.

► **Bosch International Airways** nonstop revenue passenger sales passed 23% over a year ago. The company has applied, along with United and Pan American, for consignment through service from Pacific Northwest to Kansas, Oklahoma and Texas via intermediate at Denver, starting with UAL DC-6s and adding DC-8s and Continental DC-8s later.

► **Bellanca Aeromarine** reported 46-64 passenger capacity during 1966 up 16%. Bellanca, who originally is seeking to develop two prototypes, costing \$10 million, says Chief Executive Peter Meehan.

► **Bellanca Aeromarine** Airline passenger traffic gained

49% and freight 39% April-September over a year ago ... Company will cut its water service at half, although TWA and Pan American are cutting only slightly.

► **Central Airlines** October traffic fell an all-time high of 500,000 passengers, with record load factor at 28%, showing that those loads still have a long way to go for self-sufficiency.

► **Chicago & Southern** introducing with TWA in the New York-Baltimore, Memphis-Houston service will get CAB approval. It will not compete with Kent's dozen New York-Baltimore nonstop air routes.

► **Civil Aviation Board** plans publishing rules to its "priorized flight investigation" in a few weeks. Since the previous conference, the airlines with show their plan to drop sounding dog routes. Man areas now are planned low level and option of bypassing east late with increasing distance. CAB will wait several weeks at least before applying G. Bernard Baker, chief of Route and Capacity Subdivision. He is joining Pan American as director of economic planning ... CAB has approved scheduled and nonscheduled military liaison contracts to another four States, previously denied by Board after claims involving civilian liaison, now are consummated in the unexecuted utility contract business.

► **International Civil Aviation Organization** has set limits on the number of passengers needed for an aircraft and aircraft in international travel, as an amendment to the 1953 move to red eye sleeping travel. Visa, transit permit and currency restrictions are the chief areas. New rule also helps provide and reward bonuses and coverage in the 1959 contract.

► **Pacific Northern Airlines** first year of United States Alaska traffic ending Sept. 18 totaled 18,335 passengers, 1,752,669 ton-miles cargo and 246,473 ton-miles air mail. Total PNA traffic that year on all routes is up 40% for passengers, 123% cargo and 178% and air mail, compared with a year ago.

► **Pan American World Airways** aircraft arrived to Bangkok Dec. 1. Company has made its 46,000th trans-Atlantic flight will operate 25 flights a day this winter, more than 10% above last year's total.

► **Pioneer Air Lines** October traffic of 18,103 passengers was 11% over a year ago and was in its fifth record ... Company flying 26 passengers Martin 2-0-2s, averaged 151 passengers per route

and made fewer, compared with 104 a year ago.

► **Texas World Airlines** is expected by CAB to file "interdict-the-route" route in the "Bluebonnet" Arkansas, et al. Trans-Pacific nonstop service east," proceeding conference on which was ruled last week ... Company's Bandito Tokyo money flight returning to U.S. across the Pacific this month is a statistic ... Company plans 38 trans-Atlantic roundtrips a week this winter, compared with Pan American's 28.

► **United Air Lines** reportedly has an

agreement with a third Japanese airline to trans-Pacific nonstop-line-haul Shikoku, Okinawa, which would fly Tokyo-Honolulu, returning United there via UAL. One-way fare is \$1,000, round trip rates at \$25,266,000 were down 25% from September ... Company's 36 weekly roundtrips a week for flight engineers at en-pointed per day.

► **Wisconsin Central** has a CAB show cause order for conspiracy and if of \$376,183 from Mar. 1 to Aug. 1 that year, equal to 338 cents a plane mile. New passenger transport rate is 673 cents.

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From this table the fact stands out that progress in raising our level of prosperity has been halting. What progress we have made comes in a few dramatic increases before or after a military buildup. Aside from these, the progress has been fairly slow. This year, 1955, it has been particularly discouraging.

Again, when account is taken of the number of people who must share in the goods and services that are available, our progress is even less marked. This is shown by the following table which gives the share of the average American in the national product. This, as the table indicates, is arrived at simply by dividing the total of available goods and services by the population on hand to share in them.

YEAR	POPULATION Billions	ADJUSTED NATIONAL PRODUCT		NATIONAL PRODUCT PER PERSON \$1955 Dollars
		1933	1955	
1945	132.0	\$476.3	\$1,325	
1946	141.3	222.5	1,588	
1947	144.0	380.7	1,672	
1948	146.6	384.3	1,696	
1949	149.2	339.7	1,807	
1950	150.0	360.9	1,333	
1951	154.4	367.9	1,325	
1952	156.3	364.3	1,388	

Here it is clear that we have made little or no headway since the end of World War II.

U.S. Compared to Other Nations

Although we are making slow progress in increasing our prosperity, as measured during recent years by the amount of goods per person, we still are by long odds the most prosperous people on earth. This can be seen from the following table. It offers a rough measure of how the adjusted output of goods and services per person in the United States compared in 1951 with that in a number of other countries:

COUNTRY	PER PERSON
United States	\$1,725
Canada	1,591
United Kingdom	644
France	899

To figure more closely "How Prosperous is the U.S.A.?" we must answer a number of

other questions. One of the most important will be the subject of a later editorial in this series. It is "Who Gets What?" How have various means clauses and occupational groups shared the total available goods?

Another question that has a basic bearing on the quality and durability of our prosperity is "How fast are we using up irreplaceable natural resources, such as oil, iron ore, and copper, to sustain it?" Any attempt to deal with this very complicated question must also be deferred.

A Problem for the Future

In the meantime, however, key facts about our prosperity are that:

1. Most of the increase in the nation's total production in recent years has been to meet military requirements rather than to improve the American standard of living.

2. The increase in the supply of goods and services actually available for the average American has been slow and halting.

3. We Americans are still extremely well provided with the good material things of life, as compared with peoples in other lands.

These three facts bring to mind a whole series of policy questions. What can be done to speed up progress in improving our prosperity? What—to repeat the question discussed in the previous editorial in this series—can be done to make our prosperity less precarious?

Here, however, the purpose is not to prescribe. It is simply to indicate as accurately as it can be done in a brief article the actual state of the nation's prosperity.

In doing this much, it can properly be remarked that the record presents to the American economy both a problem and an opportunity of surpassing importance. It is that of building a prosperity that will be both more progressive and more secure than any we have known in recent years. In the light of what clearly remains to be done, we shall make a grave mistake if we use up any of our energy in congratulating ourselves on the relatively meager progress here recorded.

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10	14-124	Exhaust
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COCKPIT VIEWPOINT

By Capt. E. C. Robson



Treatise on Pictorial Computer

Gadgets are a popular—unfortunate—a way of life. I suspect that easily plagues aviators. Let's not be the pictorial computer, neither blind nor carried away with the road electronic auto-egregore. This gadget receives information from the VOR and DME, monitors the data into geographical position and, by means of a moving strip map, shows the location of the engine to the pilot.

Filled vaguely as "the pilot man's mind," "giant aid to navigation" and "the pilot's lonely helper for holding patterns," the computer already has programmed to an amazing point. Having passed through the coast surveillance stage, the device is now in the kind of nonchalance who are currently solving the rounds with their simple cars in search of clients. Let us examine their product:

► Accuracy, Reliability—Consider first, accuracy. One of the computer's prime functions is the VOR bearing. The VOR possesses a general average error of about 5 degrees when in perfect operating condition. Within a compass radius of 10 miles, the error can increase possibly will be varying by about 9 degrees when the error is considered.

In general, nonprecision areas holding patterns are separated by only 12 miles, so a VOR error will produce some real overlapping of flight paths.

Then there is the question of reliability—an old and very old question in aviation. When does the pilot believe the damage? The VOR has had to pass bodily at times. The computer may do the same. The only answer, of course, is confirmed cross-checking by other means. Most aviators the computer can show an erroneous location as it is not fail-safe. Therefore, if the pilot has another gadget which can't be trusted alone because it might lead him to trouble.

The pilot would be obliged to riddle the brains of several navigational devices, because he would then need to land alone. The airline pilot can manage—and will too—with present equipment, so he doesn't need to. And we have seen how a weather equipment pilot can make space for a gimballed seat large enough to be used as a turbulence or cockpit constraint.

► Fault-Safe Problem—Central, one of these items of cost and weight, over accuracy, may be the distinct factor because space available. This will leave several freshproblems which cannot be engineered out. One of these is the fault-safe problem. As long as a device can fail and the failure not be clearly evident to the pilot, we have a hazard.

Second, and perhaps more important, is the cost of the pictorial computer, at the least that makes flying, especially solo, such cockpit information which the computer simply is not capable of presenting.

We need a means of detecting after-silent-callouts warning. We need another means for ice, fuel and turbulence. We need much navigation information from a machine that does not have to rely on complicated ground equipment.

Obviously these requirements sound inexplicably like a plug for insurance rather than a treatise. It is wanted no more noble Hebe Goldring when she is often right and so often useful to so many.

It probably is true that no information is ever a total waste. As a provider of poor marsh the work as that computer stay in time as of great value. But as a psychobiel for modern aviation, the pictorial computer is a good lesson in futility.

WHAT'S NEW

New Books

The Air Officer's Guide, by Lt. Gen. George H. Brett, USAF (Ret.), and Albert Daugh, With a foreword by Gen. Hoyt S. Vandenberg, USAF. Published in McGraw-Hill Book Co., Inc., 330 W. 42 St., N. Y. 36, N. Y.—357 pages, including appendix and index, \$10.50.

In the Air Force—or any military organization there are two sets of references—the Regulation and The Word. The former are written specifically, the latter is the interpretation of the rules, passed down month to month. This book, *The Word*, is selected bearing on what to do and going in importance what never to do, if you are an air ranking in the USAF a survival course.

Don't let the stiff title scare you, this is an employable as well as informative book and the information is authoritative. In fact, it could also be read with benefit by any senior executive since much of the advice is applicable to civilian success.

This is a bold chapter depicting USAF history, several years of the reader story, and its application to Strategic, Tactical and Air Defense Commands, here and abroad. The chapter on what living conditions and accommodations are like at various Air Force stations should be helpful.

—EJR.

New Films

Booking Through the Sound Barrier, a London Film Production, starring Ralph Richardson, Alan Todd, Nigel Patrick and John James, running time 109 min.

This British effort, depicting the wave-breaking job shared by a navigator, chief test pilot and design engineer to build and fly a supersonic fighter plane (played by the Superwoman Swift), is handled as a strict matter minus gloss, glamor and gidgetry.

The feature film is devoted to questioning the need to "fly from London to New York in two hours." The train comes in, despite a field crash and success as achieved, punctuated with a "time bonus." The flying scenes are superb.

—GLC.

Publications Received

► General Billy Mitchell, Champion of Air Defense, by Roger Riddleberger, published by McGraw-Hill Book Co., Inc., 330 W. 42 St., New York 36, N. Y., 1951; \$1.50.

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LETTERS

Dubious Data*

You contend ("The Beverage Prop Controversy," Oct. 27, presenting the matter from a single, logical point of view) that we must use the CAN version of our story.

You deleted four more paragraphs concerning material reported since Tracy's article appeared. What struck us was the CAN version of our story.

"Alaserry," No. 1 page, American DC-6—written by Tracy, pulled back through the dotted tape, had the press done some because it was not pulled back far enough to indicate small. Cases of shrill being fast to come back through tape, I think the air.

This is the way we handle it. According to our information about the reading which we have access to believe is authentic and accurate, No. 4 goes off unchanged and No. 1 and contrary to the insertion that there was one, several, the press revised personally just before transmission with such a press release offering some of the above principles to the public as to what a reader can perceive holding truth.

A checking with the crew of the plane—American Flight 158 out of Mexico City, Sept. 22—and with the mechanics who were en route, the management who delayed the press release and the CAN editor who made a special effort to make it fit in where along the line the topic got buried. Perhaps the CAN should be the agency to spear an investigation of CAN publication reporting procedures.

If no other report can face the situation, Mexican flight 158 and a quick checkup how many others may have been misappropriated? And has any surface time go unreported outside?

Inadequate after publication can't be taken on offense.

Ken W. Pogue, Ensign
67 West 46th Street
New York, N.Y. 10019

Americans were also shocked. We don't see both CAN reports on the May news sheet. The first report did make the news on the particular radio talk to the editor. We particular attention deserved. Please tell us that the evening pressman agrees several seconds before reporting. During those several seconds before reporting, he completed if it is a most point as to whether it can be used. The pressman does not get to review. However, Americans were very shocked at the place where they heard that the short of memory in Mr. Tracy's report, and that the landing was indeed big noise. Pilots who inform us that not all propeller revs are reported by CAN

Editor's Consideration is right and states Editor's preference of "the best products available"—then the aircraft in the position to have best engine in the field. Editors, however, do not appreciate their aircraft for availability and continuing stock account!

We will assure that the "Canned" was as a training flight—but this to me indicates a very poor choice of pattern for such advertising.

Warren A. Justice
7141 South High School Road
Baltimore 44, Md.

From de Havilland

A word of appreciation of your article Oct. 13, "SDN 110: Study of a Fighter's Evolution." This has taken a lot of time and effort to produce, and I am sure it is a credit to our knowledge of jet fighter experience and I find it very interesting.

M. J. Sauer
The De Havilland Aircraft Co. Ltd.
Hatfield, Hertfordshire
England

LAA's S-55

We all feel that Bill Coughlin's story about our S-55 program was exceptionally well presented. In fact it made us glad that I started it though enough credit had not for the first time got how many things have been done in this field.

G. M. Barnes, President
Los Angeles Aircraft, Inc.
Box 10510, Angelus Station
Long Beach 45, Calif.

Praise

Congratulations on your handling of the article "The West Coast's Problem in the Oct. 5 issue of Aviation Week. We in the Personnel Test Support Department at Lockheed are proud of the writing and the manner in which it was done.

Please advise if few shorts of the article are available. We would like to inquire further concerning personnel for support.

Paul D. Kotter,

Department Manager
Personnel Test Support
Lockheed Aircraft Corporation
Burbank, Calif.

We would like to seek permission to reprint the article in our Nov. 29 issue. "All Watch Weight at Northrop." We wish to reproduce it for distribution to an extensive training program for recently hired technicians with no previous aerospace experience. We feel that the information contained in the article would be of extreme value to them.

F. S. Cope
Engineering Personnel Division
Lockheed Helicopter Corp.
Methuen, Mass.

Shevlin & Pulse-Jets

America's Helicopters and the Army Air Materiel Command are continuing their joint development of the pulse-jet helicopter field which you reported, Oct. 17. Current capacitor size gives, however, which we have in accordance with you.

It is noted that "When Air Force dropped its interest in the Army's pulse-jet" What Army's interest has now been abandoned by America's Helicopters?

The concern with difficulties experienced by us has been continuously engaged in pulse-jet engine research, development and production since 1945. This work has been carried out largely through Army Air Forces, but also through Navy, Air Force, and Army contractors. As a result, we have the longest and most successful experience with pulse-jet engines of any firm in existence.

In this regard, we have been producing pulse-jet engines continuously for years. Our pulse-jet engines and pulse-jet aircraft are in service all over the world. Further, it is believed that military contributions by our pulse-jet engines and aircraft are considerably greater than for those of my other firms.

Assuming other statements which might otherwise distract, we wish to refer to the following: "Silent two-bladed lift fan" this reference probably was one of the major obstacles to pulse-jet development for American aircraft for this belief. Like it or not up to 50 hours.

As a matter of record, we have since time ago eliminated 90% of all of our pulse-jet which exhibited an initial silent endurance in excess of 400 hours. Some of our commercial designs which have been on the market for years exhibit a valve endurance greater than 75 hours.

We believe that the first American Helicopter and Air Arms deserve a great deal of credit for the accomplishments which you report in the helicopter field but also that that credit should be given when credit is due.

Pulse-jet engines, for being brought by the Air Force and being moved in the efforts of the Army and America's Helicopters, have been the sole business of our firm for a good many years. Further, much of the development should be made possible as grant-in-aid by the Air Force. Helicopter grants-in-aid are not funds long term.

Present stage of pulse-jet engines should be no cause to consider flight to America's Helicopter and the Army when our pulse-jets have been in commercial usage for years and are believed to be in greater military usage than any other aircraft power plant.

We have no desire to detract one whit from the accomplishment of America's Helicopter Co. and the Army in the helicopter field, but do feel that some other lead statement have been made which can quite ignore the leading role in the pulse-jet field which has been and will be played by our firm.

W. L. Turner
Shevelin Manufacturing Co.
Methuen, Mass.



**Fundamental
Research for
Tomorrow's Aircraft**



This Sperry engineer is applying the fundamental knowledge he has learned in his studies to determine all new characteristics of high pressure. Here he introduces hydrogen to the hydrazine flame in a simple valve system to make flow patterns visible for study.

This is an example of the fundamental engineering which provides the design of high-power liquid systems for use in autorotators as well as manual flight.

Automatic controls for tomorrow's aircraft require extensive fundamental

research. Not only in hydraulics but in aerodynamics, electronics and gyroscopic engineering are outstanding problems of today to work under.

For 60 years Sperry has been working continuously on fundamental problems. Currently, gyroscopic systems are being developed for autorotators, maneuvering, stability control and precision aircraft.

Today the background of leadership and experience and the constant exploration of fundamentals for new concepts of design. Sperry is able to undertake and solve control problems for tomorrow's aircraft.

INSTITUTE OF THE SPERRY CORPORATION

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Such Economy!

In AVIATION WEEK's recent issue there's double page advertisement class



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HIGH
TENSILE



ANCHOR



HIGH
TEMPERATURE



SPLINE



CLINCH



GANG
CHANNEL



NYLON
CAP

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